the present invention preferably provides for real-time transcoding, such that playback of A/V files requiring format conversion can occur without sequential full-file conversion delays.

In a manner analogous to that for the shared data storage unit 124, encoding, decoding, and transcoding resources are AVSC-based rather than workstation-based in the present invention. From an external perspective, the AVSS 100 provides centralized encoding, decoding, and transcoding resources, while internally the aforementioned resources are distributed amongst one or more AVSCs 120. This pooled resource organization maximizes encoding, decoding, and transcoding resource utilization efficiency, while minimizing the number of such resources required to meet any given performance requirements.

In an exemplary embodiment, an AVSC 120 is implemented as a personal computer server having a Pentium II (Intel Corporation, Santa Clara, CA) or generally-equivalent microprocessor, 128 Megabytes of Random Access Memory (RAM), an Optibase MovieMaker encoder and an Optibase VideoPlex decoder (Optibase Inc., San Jose, CA), a network interface card, and an UltraWide and Fast SCSI 18 Gigabyte or larger disk drive for storing A/V and related files.

### 4.5.2 AVSM Architecture

The AVSM 160 comprises hardware and software that manages or coordinates the processing of requests received from premises-based, campus-based, or remote CMCE elements. The processing of such requests may result in the creation, recording/encoding, storage, distribution, decoding/playback, archival, or deletion of A/V or multimedia files in the context of conference recording, telephone answering, e-mail, document generation, document publishing, or other applications as described in detail below. Those skilled in the art will understand that many architecturally varying embodiments are possible. The embodiment described below provides an enabling architectural example.

The AVSM 160 comprises a network-based multitasking computer. ***Figure*** 9 is a block diagram of an AVSM 160 constructed in accordance with the present invention. The AVSM 160 comprises a processing unit 162, a network interface 164, an AVSC interface unit 166, a data storage unit 168, and a memory 170 wherein an AVSM object





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memory 172, an AVSS state memory 174, an AVSS database memory 176, and an operating system 178 reside. Each element within the AVSM 160 is coupled to a common AVSM bus 199.

The processing unit 162 comprises a conventional high-performance processor for executing stored program instructions, and the data storage unit 168 comprises at least one disk drive. The network interface 164 and the AVSC interface unit 166 comprise conventional network interface circuitry for managing communication with the internal network 110 and AVSCs 120, respectively. The operating system 178 comprises a conventional multitasking operating system such as Windows NT.

The AVSM object memory 172 stores a plurality of AVSM software objects that perform or manage the AVSS services and resource management operations described in detail below, which include a) the establishment of user request processing sessions; b) allocation of AVSC resources and associated resource locking; c) establishment of A/V network communication couplings; d) user application interfacing and message routing; e) inter- and intra-AVSS file transfer initiation; and f) administrative operations as described in detail below. AVSM objects also maintain the contents of the AVSS database, which is stored in the AVSS database memory 176 and/or upon the data storage unit 168.

The AVSS database stores a variety of information that defines a) the AVSS communications environment; b) the nature and capabilities of the shared AVSC resources; c) administrative parameters and usage data; and d) characteristics of the A/V files stored on the AVSCs 120. Relative to the AVSS communications environment, the information the AVSS database stores includes the following:

1) the number and types of file transfer channels, including digital file transfer channels arising from AVSC couplings to the internal network 110 and the data network 20, plus analog file transfer channels corresponding to AVSC couplings to the A/V network 30;
2) a premises AVSS host name and port identifier;
3) one or more non-premises AVSS host names and port identifiers, plus connection setup information associated with each non-premises AVSS 100;

4) A/V network configuration parameters;
5) supporting server system configuration parameters;
6) a user identification (ID) or name for each user within the premises group to which the AVSS 100 belongs, plus password information corresponding to each user ID; and
7) communication preferences corresponding to each user ID, such as preferred encoding format and/or A/V file delivery format.

Relative to shared AVSC resources, the AVSS database includes the following information:

1) the number, types, and capacities of the storage resources within each AVSC 120; and
2) the number, types, and capabilities of the encoding, decoding, and transcoding resources within each AVSC 120.

The administrative parameters that reside within the AVSS database include a maximum allowable A/V file size, and a maximum allowable A/V file age. The maximum allowable A/V file age may be defined in relation to an A/V file's creation time and date, or relative to a most-recent access. The usage data includes an event statistics file that details event occurrence frequencies, such as a number of users that have accessed the AVSS 100 in a given time interval; a number of times an A/V file has been accessed; a most-recent access date and time for an A/V file; and an amount of time spent performing A/V file playback operations during a particular time interval.

For each unique A/V file stored on the AVSCs 120, the AVSS database stores a file parameter table that includes the following information:

1) a filename;
2) a file password;
3) a user ID indicating file authorship;
4) a file ownership or access privilege list, by user ID, which includes an access expiration date and time as well as recent access history (date and time) associated with the user ID;
5) A/V encoding format;

6) time and date of most-recent modification;
7) file size;
8) file playback duration;
9) file age;
10) location of each copy of the file across the AVSCs 120;
11) a list identifying and locating any AVSS-resident multimedia synchronization files associated with the A/V file; and
12) a list specifying any non-AVSS target servers to which the file has been published, as described in detail below.

For each premises group user ID, the AVSM objects could also maintain a user-specific file list in the AVSS database. In such an embodiment, the user-specific file list includes the name of each A/V file for which the user ID is specified in the file's access privilege list, and indicates whether the user ID is specified in the file's authorship data.

AVSM objects additionally maintain the contents of the AVSS state memory 174 to reflect current resource, request, and message status across all currently-active request processing sessions. The contents of the AVSS state memory 174 include the following:

1) a current user list that specifies user IDs corresponding to currently logged-in users;
2) a list of currently-active request processing sessions;
3) a time-stamped and indexed request queue identifying currently-pending requests, for both incoming and outgoing requests;
4) currently-available capacity and utilization for each AVSS storage resource;
5) current encoding/decoding/transcoding resource utilization; and
6) an AVSM event log specifying session time-out occurrences; application errors; AVSC faults; network faults; changes in the current user list and currently-active session list; changes in storage resource utilization and available storage space; and changes in encoding, decoding, and/or transcoding resource utilization. The contents of the AVSM event log are used to update the event statistics file.

In an exemplary embodiment, the AVSM 160 is implemented as a personal computer server having a Pentium II or generally-equivalent processor, a network interface card, 128 Megabytes of RAM, and a 10 Gigabyte or larger hard disk drive. Those skilled in the art will understand that the AVSM 160 could be implemented using a hardware/software platform that is essentially identical to that used for implementing an AVSC 120.

### 4.5.3 Scaling Hierarchy

The present invention can be scaled to provide enhanced performance and/or additional capabilities. Two types of scaling are possible, namely, numerical and evolutionary scaling. Numerical scaling implies the incorporation of additional hardware elements, while evolutionary scaling implies replacement of existing hardware elements with higher-performance or more "technologically evolved" hardware. The architectures described herein flexibly accommodate numerical and/or evolutionary scaling across several interrelated hierarchical performance boundaries or levels, which include the following:

**4.5.3.1** Bus and processor throughput - the capabilities of the bus and processor within an AVSC 120 or AVSM 160 respectively define one type of AVSC or AVSM performance boundary. For example, bus throughput considerations limit the amount of bandwidth available for transferring information between elements within any given AVSC 120 or AVSM 160. Through a hardware platform upgrade, which is an evolutionary scaling, this performance boundary can be surpassed or extended.

**4.5.3.2** Shared data storage unit throughput and capacity - the data transfer rate and storage capacity of the shared data storage unit 124 within any particular AVSC 120 define another performance boundary. This boundary can be surpassed by the inclusion of additional data storage devices within the shared data storage unit 124, and/or the use of higher-performance data storage devices. The performance gain achieved through numerical or evolutionary scaling in this case is dependent upon the bus throughput boundary described above.

**4.5.3.3** Shared coding unit throughput and capabilities - the A/V file processing capabilities of the shared coding unit 130 within any given AVSC 120 also define a performance boundary. The incorporation of additional encoding, decoding, and/or transcoding resources within a shared coding unit, and/or the use of higher-performance A/V processing resources, results in the extension of this boundary. Those skilled in the art will understand that higher-performance resources in this case would likely perform essentially-simultaneous encoding, decoding, and/or transcoding operations on multiple execution threads. Those skilled in the art will additionally recognize that the performance gain achieved through numerical or evolutionary scaling here is dependent upon the aforementioned bus throughput boundary.

**4.5.3.4** Collective AVSC capabilities and throughput - the overall A/V file processing performance and capabilities of the set of AVSCs 120 within the AVSS introduce another performance boundary, which can be surpassed through the incorporation of additional AVSCs 120 into the AVSS, and/or the use of higher-performance AVSCs 120. Those skilled in the art will understand that increasing the performance of any given AVSC 120 involves surpassing one or more of the previously-described performance boundaries.

**4.5.3.5** Internal network bandwidth - the data transfer capabilities or loading limitations of the AVSS internal network 110 introduce another performance boundary, which can be surpassed through evolutionary scaling.

**4.5.3.6** Collective networked AVSS performance and capabilities - the performance and capabilities of an entire AVSS group coupled via a campus and/or wide-area network also introduces a performance boundary that can be readily surpassed through numerical and/or evolutional scaling in accordance with performance requirements relative to cost constraints.

Those skilled in the art will recognize that just as a system can be scaled upward relative to performance, it can also be scaled downward, which might occur, for example, when cost constraints are of paramount importance. The architecture of the present

invention, however, can provide high A/V and/or multimedia processing performance while leveraging the capabilities of readily-available, low-cost technology.

### 4.6 Functional Partitioning Between AVSM And AVSCs

The types of functions performed by the AVSM 160 are partitioned relative to those performed by the AVSCs 120 to ensure consistent operability across essentially any internal AVSS implementation, particularly in view of numerical and evolutionary scalability. As a result, the AVSM 160 can support a continually-evolving range of AVSC implementations without modification.

The AVSM 160 provides centralized management of AVSS functionality. The AVSM 160 receives AVSS service requests and control messages from user applications. In response to service requests, the AVSM 160 establishes request processing sessions, as described in detail below. The AVSM generates a session handle to uniquely identify each such session. Exemplary AVSS service requests include the following:

1) login {user ID, password};
2) create and encode A/V file {session handle file name, file password, plus other parameters described below};
3) fetch and decode A/V file {session handle, file name, file password};
4) delete A/V file {session handle file name, file password};
5) copy A/V file {source address, source session handle, target address, target session handle plus other parameters described below}; and
6) move A/V file {source address, source session handle, target address, target session handle plus other parameters described below}.

Other types of AVSS service requests include requests for sending or receiving streams; retrieving or distributing files; and performing administrative and diagnostic operations. Control messages received from user applications include acknowledgments; error codes; and interactive control requests such as start, stop, pause, reverse, and/or fast forward commands issued during the recording, playback, and/or editing of A/V files.

In response to AVSS service requests, the AVSM 160 may directly perform one or more functions, and/or issue a set of high-level requests to its associated AVSCs 120 in accordance with AVSC capabilities and availability. In terms of directly-performed

functions, the AVSM 160 establishes and manages request processing sessions with user applications; allocates A/V file names and tracks A/V file location and usage information; allocates AVSC resources to request processing sessions based upon AVSC capabilities and availability; allocates AVSC resources to file copy and move transactions; forwards file copy and move requests to campus or remote systems in the event that an A/V file does not reside upon one of the premises AVSCs 120; and issues requests to the A/V network 30 to establish A/V communication and perform A/V network services (such as conferencing) for user applications.

Any given AVSC 120 that receives a high-level request from the AVSM 160 carries out the request by performing a set of operations in accordance with its own methods and constraints. In this manner, the AVSM 160 may be designed to avoid "micro-managing" the details of AVSC 120 operation. Depending upon the nature of a high-level request, an AVSC 120 may allocate and lock an encoding, decoding, or transcoding resource; allocate file storage space; execute an encoding, decoding, or transcoding procedure; perform a file transfer or copy operation to or from a local or remote target destination or source; delete a file; or report request processing, message, storage device, and/or encoding, decoding, or transcoding resource status to the AVSM 160.

### 4.7 AVSS Services

The AVSM 160 manages or provides a variety of AVSS services, including session management, file management, device management, and administrative services. Details of such services and the manners in which they are implemented are described hereafter.

#### 4.7.1 Session Management Services

From the perspective of application programs executing on user workstations 40 or other computers coupled to the CMCE 10, the premises AVSM 160 provides access to services associated with premises, campus, and/or wide-area AVSS resources. Any given application program typically generates one or more graphical windows plus menus and control, list, dialog, and/or other graphical boxes that form a portion of a Graphical User Interface (GUI), as described in detail below. The application program is responsive to

selections that a user graphically indicates, in a manner well understood by those skilled in the art.

Particular user selections indicate that the user requires AVSS-related services. In response to such selections, the application program issues service requests to the associated premises AVSM 160. Upon receiving a service request, the AVSM 160 establishes a request processing session to provide or oversee the provision of the required service. During the session, the AVSM 160 may directly perform one or more operations, and/or the AVSM 160 may generate one or more requests directed to premises AVSCs 120, the premises A/V network manager 34, and/or campus or remote AVSMs 160. Additionally, premises, campus, or remote CMCE elements involved in the session may generate requests directed to each other and/or the application program.

***Figure*** 10 is a block diagram illustrating session communication protocols utilized in one embodiment of the present invention. Essentially any number of instances of a wide variety of application programs communicate with their corresponding premises AVSM 160 via an AVSM client protocol. A given premises AVSM 160 communicates with its associated AVSCs 120 via an AVSC client protocol, and the premises A/V network manager 34 via an A/V network client protocol. Cross-premises AVSM-to-AVSM communication is based upon an AVSM peer protocol, while analogous A/V network manager communication is based upon an A/V network peer protocol.

Prior to gaining access to A/V processing resources or services, a workstation user must execute an AVSS access program, which issues a login request to the AVSM 160. As described in detail below, the login request includes a user ID, which establishes the user's identity to the AVSM 160 for purposes of file ownership and access permission checking. The user ID also provides the AVSM 160 with the A/V network port information necessary for establishing any A/V network connections required. In one embodiment, the login request additionally includes password information, which may be encrypted. When a user no longer requires access to A/V processing resources or services, the user may utilize the AVSS access program to issue a logout request to the AVSM 160, which results in removal of the corresponding user ID from the current user list within the AVSS state memory 174.

Following a successful login, an application program executing on the user's workstation 40 may issue a request to the AVSM 160 for A/V processing resources and/or A/V file management services. Upon receipt of a request, the AVSM 160 establishes a session by performing any necessary file access authorization operations as described below; generating a session handle that uniquely identifies the session; adding the session handle to the currently-active session list in the AVSS state memory 174; identifying and allocating appropriate AVSC resources; identifying and allocating appropriate A/V network resources; and issuing a session identification message to the requesting client, where the session identification message includes the session handle. After session establishment, the AVSM 160 manages the session by directly performing operations, and/or issuing or routing requests, control messages, and/or status messages to AVSCs 120, the A/V network manager 34, other AVSMs 160, and/or the application program. The AVSM 160 terminates the session by deallocating resources, issuing a termination message or reply to the application program, and deleting the session handle from the currently-active session list. The AVSM 160 supports at least three types of sessions, namely, 1) viewer tool sessions; 2) maintenance tool sessions; and 3) administrative tool sessions. The characteristics of each of these session types, as well as the operations undertaken by the AVSM 160 in support thereof, are described in detail hereafter.

#### 4.7.1.1 Viewer Tool Sessions

Herein, a viewer tool comprises an application program that controls A/V file recording as well as real-time analog or digital streaming A/V file delivery or viewing via one or more graphical windows, menus, and control, dialog, or other boxes that facilitate user input. The AVSM 160 establishes a viewer tool session when a viewer tool application executing on a workstation 40 or other computer issues a request specifying that either real-time (or near-real-time) analog or digital streaming delivery of an A/V or multimedia file is required (i.e., when a user needs to view an A/V file). Real-time analog or digital streaming delivery is required, for example, during A/V file recording, editing, and/or playback, and involves A/V signal delivery to a display device (such as a

workstation monitor or television) under the direction of the viewer tool application program.

To initiate a viewer tool session, the AVSM 160 determines whether the request received from the viewer tool application specifies an existing A/V or multimedia file. If so, the AVSM 160 performs file access authorization operations, as described in detail below, to verify whether the viewer tool user should be granted access to the file. If the file access authorization operations are unsuccessful, the AVSM 160 issues a reply to the requesting viewer tool application indicating proper access authorization does not exist, and the viewer tool session ends.

Upon successful completion of the file access authorization operations, the AVSM 160 generates a session handle, and adds it to the currently-active session list. The AVSM 160 next identifies an AVSC 120 that includes A/V processing resources capable of performing the operations required by the viewer tool application. In one embodiment, the AVSC selection is performed in accordance with the resource allocation operations described in detail below. For the creation (i.e., recording) of a new A/V or multimedia file, the AVSM 160 selects an AVSC 120 upon which sufficient storage space and an appropriate type of encoder exist. For the playback or editing of an existing A/V or multimedia file, the AVSM 160 selects an AVSC 120 upon which a copy of the file resides and appropriate decoding or transcoding resources are present.

After identifying an appropriate AVSC 120, the AVSM 160 sends a request to the AVSC 120 to allocate the resources required for performing the operation(s) required by the viewer tool application program. In one embodiment, the AVSM 160 subsequently issues a request to the AV network manager 34 to establish any required A/V network connections. In an alternate embodiment, the viewer tool application program issues a request to the A/V network manager 34 to establish such connections. After AVSC selection/resource allocation and A/V network connection establishment, the AVSM 160 issues a session identification message containing the session handle to the viewer tool application, which indicates that the viewer tool session can proceed.

During the viewer tool session, the AVSM 160 routes control messages received from the viewer tool application to the selected AVSC 120, thereby facilitating AVSC

performance of open-file, play, adjust-playback-rate, stop, seek, pause, rewind, fast-forward, record, save-file, or other operations as supported by the viewer tool application program. The AVSM 160 may additionally issue status messages to the viewer tool application, which can include video frame numbers and/or running or elapsed time. In one embodiment, the AVSM 160 polls the AVSC 120 for status information, and forwards it to the viewer tool application program.

A multimedia file comprises one or more types of files and/or references to files, where such files may include textual, graphical, image, audio, and/or video information as well as commands or event sequences for generating or rendering such information. The multimedia file may further include temporal correlation data specifying one or more manners in which its constituent files and/or file references are associated in time. In the context of the present invention, a multimedia file comprises one or more omnifiles, where an omnifile is defined as a metafile plus a corresponding pointer file. The metafile includes one or more of the following types of files:

1) A/V files;
2) audio-only files;
3) video-only files;
4) bitmap files;
5) postscript files;
6) graphics files;
7) text files;
8) application files; and
9) synchronization files.

The synchronization files associate events or commands occurring within the context of one or more application programs with particular time references, which may be A/V file frame numbers. Synchronization files can include application startup event files, text event files, window event files, graphics rendering event files, and shareboard event files, as further described below. In one embodiment, a synchronization file can include a priority level for each command or event specified therein. The various files that comprise the metafile may be stored across one or more workstations 40, AVSCs 120,

servers, or other computers coupled to the CMCE 10. The pointer file associated with a metafile contains pointers or references to each element within the metafile.

In one embodiment, the synchronization files are stored on AVSCs 120. In the event that the viewer tool session involves multimedia file recording, the AVSM 160 transfers application program synchronization information or commands received from the viewer tool application to the AVSC 120 such that the synchronization information can be saved in a synchronization file. For multimedia file playback and/or editing, the AVSM 160 requests the synchronization file from the appropriate AVSC 120. To ensure temporal consistency during playback operations, the AVSM 160 polls the AVSC 120 allocated to serving the current viewer tool session for frame number or time-based A/V file data, and issues synchronization messages to the viewer tool application at appropriate times or intervals, in accordance with a currently-specified playback frame rate or speed. The synchronization messages contain event information, commands, and command priority levels specified within the synchronization file. Upon receipt of a synchronization message, the viewer tool application executes commands specified therein, or facilitates the execution of such commands via their transfer to other application programs, thereby regenerating application events and/or the presentation of textual, graphics, image, or other multimedia content information at appropriate times while A/V file playback occurs.

The AVSM 160 could alternatively transfer the synchronization file to the viewer tool application, poll the AVSC 120 for frame-number or time-based A/V file data, and issue frame or time status messages to the viewer tool. The viewer tool application could then execute or issue the appropriate commands to facilitate multimedia synchronization upon receipt of frame or time status messages that correspond to frame numbers or times specified within the synchronization file. In other embodiments, the synchronization files themselves could be stored on the AVSM 160 rather than on AVSCs 120, or the synchronization files could normally reside upon the user workstation 40.

In one embodiment, in the event that the viewer tool session involved A/V file or multimedia file editing and file edits or changes were saved while maintaining the filename, the AVSM 160 performs modification propagation operations as described in

detail below to ensure that the file changes propagate to each copy of the A/V file stored on the AVSCs 120.

The operations described above pertain to within-premises viewer tool sessions. Non-premises viewer tool sessions occur in an analogous manner. In one embodiment, in the event that a viewer tool application requires real-time/near real-time analog or digital streaming A/V file delivery from a non-premises AVSS 100, the viewer tool application issues a request to the appropriate non-premises AVSM 160. In response, the non-premises AVSM 160 establishes a viewer tool session in the manner described above, such that analog A/V signals are exchanged via the premises workstation 40, the premises codec gateway 38, the second WAN 39, and the non-premises codec gateway 38 that serves the non-premises AVSS 100.

A viewer tool provides a workstation user with a Graphical User Interface (GUI) for controlling A/V file recording and playback operations. ***Figure*** 11 is a block diagram showing an exemplary recording control GUI 500. The recording control GUI 500 comprises a graphical window that includes a menu bar 502, a title box 504, a recording control panel 506, and a time panel 520. The menu bar 502 provides a workstation user with access to conventional types of submenus, including file, options, and help submenus. User-selectable operations from within the options submenu include login and change-password operations. User-selectable operations from within the file submenu include the following:

1) New – opens a new A/V file for recording, in the manner described below;

2) Open – invokes a browser tool that facilitates opening and subsequent playback of an existing A/V file, as described below;

2) Save – saves an A/V file with a given filename;

3) Properties – facilitates entry and editing of properties associated with the A/V file being recorded, such as encoding type and a natural language title; and

4) Exit – terminates the viewer tool session.

The title box 504 identifies the current title of an A/V file under consideration. The recording control panel 506 provides a set of user-selectable buttons for controlling recording operations. These buttons include a start recording button 510; a pause

recording button 512; a stop or end recording button 514, and an erase or discard recorded information button 516. The time panel 520 graphically indicates a current recording length or time via the provision of a slider bar 522 and a time box 524.

***Figure*** 12 is a block diagram showing an exemplary playback control GUI 600. For ease of understanding, common elements shown in ***Figures*** 11 and 12 are denoted with common reference numbers. The playback control GUI 600 comprises a graphical window that includes a menu bar 502, a title box 504, a playback control panel 606, and a time panel 520. The menu bar 502 enables user to select from among the operations described above with reference to ***Figure*** 11. Similarly, the title box 504 indicates the current title of the A/V file under consideration. The playback control panel 606 includes a plurality of user-selectable buttons that facilitate playback control operations, including a rewind to beginning button 610; a skip back button 612 that facilitates moving or jumping backward to an earlier position within an A/V file, where the earlier position corresponds to a predetermined or user-definable time increment, for example, 3 seconds; a playback start button 614; a playback pause button 616; a skip forward button 618 that facilitates moving or jumping backward to a later position within an A/V file, where the later position corresponds to a predetermined or user-definable time increment, for example, 3 seconds; and an erase file button 619. In a manner analogous to that for the recording control GUI 500, the time panel 520 graphically indicates a current playback length or time via the provision of a slider bar 522 and a time box 524. Those skilled in the art will understand that the recording and playback control GUIs 500, 600 provide workstation users with a graphical interface that is visually consistent with controls found on common devices such as Video Cassette Recorders (VCRs).

In response to certain submenu selections, such as Open within the file submenu, the viewer tool transfers control to or invokes functionality within or associated with a browsing or administrative tool to provide a workstation user with a GUI for browsing and selecting A/V files and/or performing A/V file administration operations as described in detail below. ***Figure*** 13 is a block diagram showing an exemplary browsing control GUI 700. The browsing control GUI 700 comprises a dialog box that includes a file source listbox 702 and file source control buttons 704; display format control buttons 706;

a file information listbox 710; a file name box 722; a file type listbox 724; and operation control buttons 730, 732, 734. The file source listbox 702 and associated file source control buttons 704 facilitate user-identification of a file source from which A/V files can be selected for consideration. The display format control buttons 706 facilitate user-selection of file information display formats, where available display formats include display-by-icon and display-by-attributes. For each A/V file for which the workstation user is identified as an owner, the file information listbox 710 displays file information in accordance with the selected file parameter display format. Such information can include a filename; a file location; a natural language title; a description; file authorship; and playback duration. The file name box 722 facilitates user-entry of a specific filename, and the file type listbox 724 facilitates browsing operations directed to files of a specific type. Finally, the operation control buttons include an open button 730, the selection of which results in the opening of a specified or selected A/V file for playback operations; a cancel button 732; and a help button 734.

#### 4.7.2 Maintenance Tool Sessions

The AVSM 160 establishes a maintenance tool session in response to a request that specifies that one or more user-based file maintenance operations are required. In the context of the present invention, a maintenance tool comprises an application program executing on a user workstation 40 or other computer, and which generates one or more graphical windows, menus, and/or boxes that facilitate particular A/V file maintenance operations in response to user input. In one embodiment, the user input may be in the form of text, graphical selections, or graphical drag-and-drop sequences.

As described in detail below, the AVSM 160 supports many file management operations, a subset of that comprises file maintenance operations that are directly available to workstation users. In one embodiment, the file maintenance operations include file access list maintenance; file expiration date maintenance; file renaming; file transfer in the form of either copying or moving; file deletion; user-specific file listing; user-specific archival operations; and file attribute queries. Each of these operations is described in detail below in the context of AVSM file management operations. Those

skilled in the art will recognize that the file maintenance operations could include additional or fewer types of operations in another embodiment.

The AVSM 160 initiates a maintenance tool session by performing A/V file access authorization operations as described in detail below. If access authorization is unsuccessful, the AVSM 160 terminates the session. Otherwise, the AVSM 160 generates a session handle, adds it to the currently-active session list, and issues a session identification message to the maintenance tool application. The AVSM 160 determines whether access to one or more campus and/or remote AVSMs 160 is required to process the file maintenance request, and, if so, issues requests to allocate the required campus and/or remote resources. Once such resources are allocated, the campus and/or remote AVSMs 160 issue a reply to the premises AVSM 160 specifying AVSC network address information if required. The AVSM 160 subsequently determines what premises AVSCs 120 are required to process the file maintenance request, and issues requests to the premises AVSCs 120 to allocate the appropriate resources and begin performing the required operation.

During the performance of file maintenance operations, the AVSM 160 issues status requests to premises and/or non-premises AVSCs 120, which reply with status information. The AVSM 160 then sends status messages to the file maintenance tool application accordingly. Such status messages may indicate, for example, a percentage of the operation that has been completed or an estimated amount of time remaining until completion. Once the file maintenance operation is complete, the AVSM 160 issues a session termination reply to the maintenance tool.

Some file maintenance operations, such as A/V file renaming or copying, may be requested within the context of a viewer tool session. That is, one or more aspects of maintenance tool functionality may be incorporated into a viewing tool. In such situations, the AVSM 160 performs or oversees the performance of the file maintenance operation within the context of the viewer tool session, in a manner essentially identical or analogous to that described for the file maintenance tool session. Moreover, in one embodiment, a maintenance tool may provide for the invocation of a particular viewer

tool in response to user input, in which case the AVSM 160 establishes a viewer tool session as a result.

#### 4.7.3 Administrative Tool Sessions

Herein, an administrative tool comprises an application program that generates, presents, and/or manages administrative information on a workstation-based or other display device in response to user input. The AVSM 160 establishes an administrative tool session in response to a request for user-accessible information stored in the AVSS database. Such information may include, for example, user account and password information, or particular data within the event statistics file.

Upon receiving an administrative information request, the AVSM 160 generates a session handle, and adds it to the currently-active session list. The AVSM 160 then transfers data corresponding to the request to the administrative tool. Upon receiving the data, the administrative tool generates and/or presents administrative information to the user. If administrative data is user-modifiable, as could be the case for user passwords, the AVSM 160 changes the data within the AVSS database in response to a request received from the administrative tool. Some administrative data may be non-user-modifiable, such as current AVSS utilization; AVSS usage history for the user, which may include average session length, by session type; and/or current charges billed to the user.

#### 4.7.4 File Management Services

As indicated above, the AVSM 160 provides or oversees the provision of a variety of file management services. A subset of the file management services comprise the user-accessible file maintenance operations, while other file management services are performed by the AVSM 160 on an internal-only basis. In one embodiment, the file management services include the following:

##### 4.7.4.1 Access Authorization Services

AVSM software objects maintain the access privilege list within each A/V file's parameter table in the AVSS database. The access privilege list comprises a list of user IDs that specifies which users "own" the A/V file, where ownership implies basic access rights to the A/V file. The extent of A/V file access rights may depend upon whether a

user falls into a particular category, such as the A/V file's author or other category as detailed below. In one embodiment, an A/V file access request generated by a client application program includes a user ID, a filename, and a password. Upon receiving such a request, the AVSM 160 determines whether the user ID associated with the request is specified within the A/V file's access privilege list. If so, the AVSM 160 proceeds with processing the file access request. If the user ID is not specified within the access privilege list, the AVSM 160 compares the password specified within the A/V file access request with that in the file parameter table. If the passwords match, the AVSM 160 adds the user ID to the access privilege list, and proceeds with request processing operations. Otherwise, the AVSM 160 issues a reply containing an error code to the client application program to indicate that A/V file access has been denied.

In one embodiment, the presence of a reserved user ID in an A/V file's access privilege indicates that the file may be accessed by any user, that is, the file is generally or publicly accessible. One embodiment of the present invention also provides for an administrative "super-user" defined to have essentially unlimited access privileges for any A/V file. In response to a request for A/V file access received from an application program associated with the super-user, the AVSM 160 proceeds with request processing operations.

#### 4.7.4.2 Access List Maintenance

In response to an access list maintenance request received from a client application program, the AVSM 160 selectively adds user IDs to or deletes user IDs from an A/V file's access permission list. The AVSM 160 performs access list maintenance operations only for users having a user ID specified in the access permission list, subject to the whether a user is the A/V file author, an owner, or a super-user. The AVSM 160 allows an A/V file author or a super-user to modify the access permission list as required. The AVSM 160 permits any given A/V file owner that is not the file's author to remove their user ID from the access permission list.

In one embodiment, the AVSM 160 adds the user ID of a user who authors an A/V file to the A/V file's access permission list by default. The AVSM 160 may add other user IDs to the access permission list in response to client application program

requests. For example, an A/V- or multimedia-enabled e-mail application program as described in detail below allows message authors to include an A/V or multimedia file as a MIME-based message attachment. The AVSM 160 adds the user ID corresponding to each message recipient to the A/V file's access permission list, as directed by the e-mail application program. The AVSM 160 may also or alternatively add a message recipient's user ID to the access permission list in response to an A/V file access request specifying a user ID, a filename, and a valid password.

#### 4.7.4.3 User-Specific File Listing

An application program associated with or executing on behalf of a user may issue a file listing request to the AVSM 160. In turn, the AVSM 160 performs a directory sort operation, and replies to the application program with a list identifying each A/V file for which the user is specified as an owner in the file's access permission list. In an alternate embodiment in which the AVSM 160 maintains a user-specific file list in the AVSS database as described above, the AVSM 160 could reply to the application program with data from the user-specific file list.

The application program may subsequently display a set of filenames for which the user is specified as an owner. In one embodiment, the file listing request may indicate that data for publicly-available files is also required. If so, the AVSM 160 provides such data to the requesting application program.

#### 4.7.4.4 User-Specific File Archival

An application program may additionally issue a file archival request to the AVSM 160, where the file archival request identifies one or more A/V files owned by the user associated with the requesting application program for which archival operations are required. The AVSM 160 subsequently manages archival operations in which the identified A/V files or copies thereof are stored in a premises or non-premises user ID-based archive. The archival operations include one or more file transfer services as detailed below.

#### 4.7.4.5 Attribute Query

In response to an attribute request received from an owner of an A/V file, the AVSM 160 provides attribute information for the A/V file, such as file author, size,

encoding type, playback duration, current file age, time and date the owner last accessed the file, file expiration date (i.e., access expiration date) for the owner, and/or date of most-recent modification.

#### 4.7.4.6 File Transfer Services

File transfer services supported by the AVSM 160 include a) A/V file copy and/or move (i.e., relocate) operations to and/or from a target destination or source; b) file import or export operations between a workstation 40 or other computer and an AVSC 120; and c) digital file publishing operations between an AVSC 120 and a server external to the AVSS 100 in which the AVSC 120 resides. With regard to A/V file copy or move operations, the target destination or source may be premises-, campus-, or wide-area-based. Since any given AVSS 100 may be linked to another AVSS 100 via a LAN or a WAN, both intra- and inter-AVSS file transfers are possible in the context of the present invention. ***Figure*** 14 is a block diagram of an exemplary networked AVSS organization. In the exemplary networked AVSS organization, a first AVSS 100.1 through kth AVSS 100.2 serve a common campus, and hence are coupled to a common data network 20. A remote AVSS 100.3 is coupled to the common data network 20 via a WAN 29. Those skilled in the art will recognize that the exemplary networked AVSS organization shown in ***Figure*** 14 can be generalized to accommodate essentially any required network organization or geographic scaling.

Each AVSS 100 in ***Figure*** 14 includes a set of AVSCs 120, where each AVSC 120 includes a number of disk drives or other devices for storing A/V files. The number of AVSCs 120 can vary from one AVSS 100 to another, as can the number and type of storage devices from one AVSC 120 to another. Relative to intra-AVSS file transfers, A/V files can be transferred from one storage device to another either a) within the same AVSC 120, that is, "within cell" (WC); or b) across different AVSCs 120 in the same AVSS 100, or "cell to cell" (CC). In terms of A/V file transfers directed from an AVSC storage device within one AVSS 100 to an AVSC storage device within another AVSS 100, such transfers can occur either a) within the common campus, or local area (LA); or b) on a wide area (WA) basis, between a common campus AVSS 100 and the remote AVSS 100.

In response to a request that requires a cell-to-cell or within-cell A/V file transfer, the AVSM 160 selects and allocates a source and a destination premises AVSC 120, and issues a request to the one of the selected AVSCs 120 to perform the required transfer. In one embodiment, the request may specify a copy-from, move-from, copy-to, or move-to operation. After the file transfer is complete, the AVSC 120 that fulfilled the request issues a reply to the AVSM 160.

If a file transfer request requires A/V file transfer between a premises and a non-premises AVSS 100, the premises AVSM 160 issues a request to the non-premises AVSM 160 to obtain network address information for an associated non-premises AVSC 120 that can participate in fulfilling the request. Upon receiving such information from the non-premises AVSM 160, the premises AVSM 160 selects and allocates an appropriate premises AVSC 120, and issues a request to the premises AVSC 120 to perform the required file transfer operation. If the file transfer request specifies a copy-to or move-to operation, the A/V file will be transferred from the premises AVSC 120 to the non-premises AVSC 120 accordingly. If the file transfer request specifies a copy-from or move-from operation, the A/V file will be copied or moved from the non-premises AVSC 120 to the premises AVSC 120, respectively. After the file transfer is complete, the premises AVSC 120 issues a reply to the premises AVSM 160. The premises AVSM 160 then issues a notification to the non-premises AVSM 160 to indicate that the file transfer session is complete.

***Figure*** 14 also shows a workstation 40 coupled to the common data network 20. File import operations involve the transfer of a digital file from a workstation 40 or other computer to an AVSC 120, while file export operations involve the transfer of a digital file from an AVSC 120 to a workstation 40 or other computer. In response to a file import request received from a client application program, the AVSM 160 selects and allocates an available AVSC 120 having sufficient storage space, and issues a request to the AVSC 120 to retrieve the file from the workstation 40 or other computer from which the import request originated. Similarly, in response to a file export request specifying an A/V file, the AVSM 160 selects and allocates an AVSC 120 upon which a copy of the file resides, and issues a request to the AVSC 120 to transfer the file to the workstation 40 or

other computer from which the export request originated. Upon completion of file transfer operations corresponding to an import or/and export request, the AVSC 120 issues a reply to the AVSM 160.

File publishing operations involve the transfer of a digital file from an AVSC 120 to a server. The server may be essentially any computer system external to the AVSS 100 in which the AVSC 120 resides, for example, an intranet server system 60 or a server coupled to the internet 80. ***Figure*** 14 also shows an intranet server system 60 coupled to the common data network 20. In response to a publish file request that specifies a filename, a target file format, and a network or IP address of a server, the AVSM 160 selects and allocates an AVSC 120 upon which a copy of the file resides. The AVSM 160 then issues a publish request to the AVSC 120, which performs any necessary file format conversion, and transfers the file to the specified server. Upon completing the transfer, the AVSC 120 issues a reply to the AVSM 160.

In general, an AVSC 120 can directly perform both A/V file encoding, decoding, and/or transcoding operations, as well as file transfer operations. Any particular AVSC 120 will have a maximum number of simultaneously-active file transfers it can perform while still delivering high-quality encoding, decoding, or transcoding performance. Thus, file transfer needs must be balanced against encoding, decoding, and/or transcoding needs. Typically, encoding, decoding, and/or transcoding operations are given higher priority than file transfer operations. In one embodiment, an administrative application program facilitates defining a first-priority and a second-priority AVSC bus and disk bandwidth partition. The first-priority bandwidth partition is reserved for performing encoding/decoding/transcoding operations, while the second-priority partition is reserved for file transfer operations. As file transfer requests are allocated to an AVSC 120, it services them immediately using bandwidth within the second-priority partition. If the AVSC 120 receives a file transfer request that it cannot immediately service, the AVSC 120 places the request into the request queue within its state memory 154. Requests in this queue are served as more bandwidth becomes available within the second-priority partition. In one embodiment, the request queue is implemented as a First-In, First-Out (FIFO) queue in a conventional manner. The request queue could alternatively be

implemented as a prioritized queue, and/or as a queue from which requests are serviced in accordance with current resource availability. Alternatively, requests that cannot be immediately serviced could be terminated and a reply sent back indicating resources are not currently available thereby allowing the AVSM 160 and/or client application to look for some other means to service the request.

#### 4.7.4.7 File Replication

An A/V file should be present upon multiple AVSCs 120 to ensure that the file can be independently accessed by a reasonably large number of users at any given time. Thus, after A/V file creation (i.e., after a new A/V file has been created and saved), or after the transfer of a new A/V file onto one of the premises AVSCs 120, the AVSM 160 initiates file replication operations. During the file replication operations, copies of the A/V file are stored on a plurality of premises AVSCs 120. In one embodiment, copies of associated multimedia synchronization files are also replicated.

The particular file replication strategy employed at any given time depends upon several factors, including the number of premises AVSCs 120 present; the performance capabilities of each AVSC 120; AVSS internal network bandwidth; and/or current user demand for AVSC resources. In an AVSS 100 employing a single AVSC 120, file replication may not be performed, or limited file replication may occur between separate storage devices on the AVSC 120. For an AVSS having a small number of AVSCs 120 -- for example, three AVSCs 120 serving approximately 100 users -- full replication may be performed. In this case, the AVSM 160 automatically oversees the copying of a new A/V file to each AVSC 120 within the AVSS 100. The copying operations are performed in the manner described above for cell-to-cell file transfer operations. In general, the A/V file is not replicated to a non-premises AVSC 120 in the absence of an application-level request to do so.

Depending upon the performance capabilities of each AVSC 120, as well as the number of premises AVSCs present, full replication may significantly limit AVSC availability for performing other operations. Thus, for an AVSS 100 employing a medium to somewhat large number of premises AVSCs 120 -- for example, five AVSCs 120 serving a few hundred to several hundred users -- the AVSM 160 manages partial file

replication operations. During the partial file replication operations, the AVSM 160 oversees A/V file copying to a subset of the premises AVSCs 120, where the copying operations are performed in the manner described above for cell-to-cell file transfer. The A/V file is not generally replicated to a non-premises AVSC unless an application program issues a request requiring such replication. The selection of a particular AVSC 120 as a member of the aforementioned subset may be based upon the number of A/V files, available file storage space, or the number of decoders and transcoders residing upon the AVSC 120.

At some point, partial replication becomes untenable as the number of premises AVSCs 120 within the AVSS 100 becomes very large. In such situations, a subset of the AVSCs 120 are utilized as streaming A/V file servers, and the other AVSCs function as staging points for encoding, decoding, and/or transcoding operations. In one embodiment, the AVSM 160 manages file replication operations for the streaming A/V file servers in a manner analogous to that described above.

#### 4.7.4.8 File Renaming

In response to a name change request, the AVSM 160 changes an A/V file's name as specified in the corresponding file parameter table, and subsequently oversees modification propagation operations as detailed below to change the name of each copy of the A/V file stored across the premises AVSCs 120. In one embodiment, the AVSM 160 permits a name change only if requested by an application program corresponding to a super-user. The AVSM 160 may further permit a name change request for the A/V file's author in the event that the author is currently the sole A/V file owner.

#### 4.7.4.9 File Deletion

In response to a file deletion request, the AVSM 160 directs the deletion of each copy of the A/V file from the premises AVSCs 120 by issuing a delete request to each AVSC 120 upon which a copy of the A/V file resides. In one embodiment, the AVSM 160 permits file deletion only if requested by an application program associated with a super-user. The AVSM 160 may further permit A/V file deletion by the A/V file's author in the event that the author is currently the sole A/V file owner. In one embodiment, the AVSM 160 additionally deletes or oversees the deletion of any multimedia synchronization

files associated with the deleted A/V file. Additionally, the AVSM 160 may issue deletion requests to non-premises AVSM 160 and servers 60 and 80 to which it has transferred the A/V file.

#### 4.7.4.10 Modification Propagation

As previously indicated, multiple copies of any given A/V file may reside upon the premises AVSCs 120. The AVSM 160 may permit a given user, such as a super-user or an A/V file's author, to edit or change the file's name or contents after its creation. Each premises copy of the A/V file must be updated to reflect such modification. Thus, in one embodiment, after an A/V filename or contents change, the AVSM 160 issues a sequence of copy-to requests to the AVSC 120 upon which the modified file resides to ensure name and contents consistency between the A/V file copies stored on the AVSCs 120. In an alternate embodiment, the AVSM 160 could issue copy-from requests. Additionally, the AVSM 160 may issue file modification requests to non-premises AVSM 160 and servers 60 and 80 to which it has transferred the A/V file.

#### 4.7.4.11 Expiration Operations

An A/V file's access privilege list includes for each user ID an expiration date and/or time past which the user ID expires and is no longer valid for obtaining file access. For each A/V file parameter table in the AVSS database, the AVSM 160 determines whether any user IDs specified in the access privilege list have expired. If so, the AVSM 160 removes the expired user IDs from the access privilege list. Once no unexpired user IDs remain in the access privilege list, the AVSM 160 issues a file deletion request to each AVSC 120 upon which a copy of the A/V file resides. After each such AVSC 120 has deleted the A/V file, the AVSM 160 deletes the A/V file parameter table from the AVSS database. Alternatively, the AVSM 160 may log expired files and require deletion by an application program associated with a super-user.

#### 4.7.4.12 Database Consistency Operations

The AVSM 160 periodically performs consistency checks to ensure that the file parameter tables within the AVSS database 136 accurately reflect the current premises AVSC file environment. In one embodiment, the AVSM 160 periodically queries each premises AVSC 120 to obtain data for each A/V file stored thereupon, where such data

may include an A/V file's name, size, age, encoding format, storage location or address, or other information. In the event that an AVSC 120 returns a filename that is not specified in the AVSS database, the AVSM 160 generates a file parameter table corresponding to the filename, and adds it to the AVSS database. If no AVSC 120 returns a particular filename specified in the AVSS database, the AVSM 160 deletes the corresponding file parameter table from the AVSS database. If the file data returned by an AVSC 120 indicate a discrepancy in file size, age, encoding format, or other information, the AVSM 160 may update the AVSS database accordingly. The AVSM 160 may additionally log any discrepancies, as well as the type of action(s) undertaken in response to each discrepancy. Finally, if a particular AVSC 120 returns a filename specified in the AVSS database, but for which the file parameter table indicates that the file is not stored on this AVSC 120, the AVSM 160 updates the file parameter table with the storage location of the A/V file upon the AVSC 120 in question.

#### 4.7.5 Device Management Services

The AVSM 160 additionally performs device management services, which include AVSC scheduling and allocation services. AVSS resource scheduling and allocation is subject to several:

interacting resource constraints, which include the following:

1. AVSM multiple-thread resources (i.e., simultaneous use by multiple sessions):
    a. CPU capacity:
        i. encode session management
        ii. decode session management
        iii. file transfer session management
    b. Bus capacity
    c. Networking port capacity
2. AVSC multiple-thread resources (i.e., simultaneous use by multiple sessions):
    a. CPU capacity:
        i. encode session management
        ii. decode session management
        iii. file transfer session management

iv. stream session management
v. audio-video stream multiplexing processes
vi. audio-video stream demultiplexing processes
vii. encode session processes
viii. decode session processes
ix. file transfer processes
x. send stream processes
xi. receive stream processes

b. Bus capacity
c. Disk controller/disk bus (e.g. SCSI) capacity
d. Disk read/write/seek capacity
e. Networking port capacity

3. AVSC single-threaded resources (i.e., can be used by only one session at a time):
a. encoder hardware and corresponding encode session(s)
b. decoder hardware and corresponding decode session(s)

Any type of session has a specific number of specific resources required to execute the session. Some embodiments may grant service requests without regard to details of the current utilization of the resources; however, this may result in underutilization of the resources or in unacceptable performance shortcomings or failure modes if the resource capacities are exceeded. One embodiment would base request acceptance on the needs of the request in view of the available unused capacity of the system. An example of how this can be accomplished is described hereafter.

In some cases, resource requirements may be exact. In other cases, resource requirements may be in the form of upper bounds, estimated averages, or averages biased upwards to provide safety margins. These session-type resource usage estimates may or may not include additional "padding" to allow for processing overhead (task switching, paging, etc.). In the absence of padding in the session-type resource usage estimates, overhead can be provide for by either

· reducing the maximum value of available resource to a value that safely accounts for worse-case incurred overhead at full operating capacity, or

· introducing a specific linear or nonlinear overhead function dependent on the number of various sessions active or projected within the AVSS 100.

Some of the resource usage estimates could be firm fixed values; for example:

· each "encode" session could be designed to require a fully dedicated encoder hardware subsystem;

· each "encode" session could be designed to allocate a fixed block of disk memory (said size dependent on the application) and attempts to record beyond this would be prevented; or

· every "decode" session will have knowledge of the exact the file size

It may be more likely, however, that resource usage estimates would not be firm; for example:

· all active encode sessions could share a slightly smaller pool of encoders; and

· all encode session requirements could be handled with averages and attempts to record beyond this would be allowed.

To further illustrate an example of resource allocation process, the following table provides an example framework for resource requirements for several different types of sessions. Other embodiments of course may have different session types and resource requirements.

| Type of Resource | | Type of Session | | | | | |
|---|---|---|---|---|---|---|---|
| | | Encode | Decode | Put File | Get File | Send Stream | Receive Stream |
| AVSM CPU capacity | Encode session management | $M^{E}_{SM}$ | | | | | |
| | Decode session management | | $M^{D}_{SM}$ | | | | |
| | file xfr session management | | | $M^{PF}_{SM}$ | $M^{GF}_{SM}$ | | |
| | stream session management | | | | | $M^{SS}_{SM}$ | $M^{RS}_{SM}$ |
| AVSM Bus capacity | | $M^{E}_{B}$ | $M^{D}_{B}$ | $M^{PF}_{B}$ | $M^{GF}_{B}$ | $M^{SS}_{B}$ | $M^{RS}_{B}$ |
| AVSM Networking port capacity | | $M^{E}_{N}$ | $M^{D}_{N}$ | $M^{PF}_{N}$ | $M^{GF}_{N}$ | $M^{SS}_{N}$ | $M^{RS}_{N}$ |
| AVSC CPU capacity | encode session management | $C^{E}_{SM}$ | | | | | |

| Type of Resource | Type of Session | | | | | |
|---|---|---|---|---|---|---|
| | Encode | Decode | Put File | Get File | Send Stream | Receive Stream |
| decode session management | | $C^{D}_{SM}$ | | | | |
| file xfr session management | | | $C^{PF}_{SM}$ | $C^{GF}_{SM}$ | | |
| stream session management | | | | | $C^{SS}_{SM}$ | $C^{RS}_{SM}$ |
| multiplexing processes | $C^{E}_{MP}$ | | | | | |
| demultiplexing processes | | $C^{D}_{MP}$ | | | | |
| encode session processes | $C^{E}_{CP}$ | | | | | |
| decode session processes | | $C^{D}_{CP}$ | | | | |
| file transfer processes | | | $C^{PF}_{TP}$ | $C^{GF}_{TP}$ | | |
| send stream processes | | | | | $C^{SS}_{SP}$ | |
| receive stream processes | | | | | | $C^{RS}_{SP}$ |
| AVSC Bus capacity | $C^{E}_{B}$ | $C^{D}_{B}$ | $C^{PF}_{B}$ | $C^{GF}_{B}$ | $C^{SS}_{B}$ | $C^{RS}_{B}$ |
| AVSC Disk controller/disk bus capacity | $C^{E}_{DC}$ | $C^{D}_{DC}$ | $C^{PF}_{DC}$ | $C^{GF}_{DC}$ | $C^{SS}_{DC}$ | $C^{RS}_{DC}$ |
| AVSC Disk read/write/seek capacity | $C^{E}_{RW}$ | $C^{D}_{RW}$ | $C^{PF}_{RW}$ | $C^{GF}_{RW}$ | $C^{SS}_{RW}$ | $C^{RS}_{RW}$ |
| AVSC Networking port capacity | $C^{E}_{N}$ | $C^{D}_{N}$ | $C^{PF}_{N}$ | $C^{GF}_{N}$ | $C^{SS}_{N}$ | $C^{RS}_{N}$ |
| AVSC hardware encoder hardware | $C^{E}_{EH}$ | | | | | |
| decoder hardware | | $C^{D}_{DH}$ | | | | |

Each type of resource, or group of resources, has a finite maximum performance value that can be provided by the AVSM 160 or AVSC 120 environments within the AVSS 100. This finite maximum value will be termed a "capacity bound."

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$M^{MAX}_{SM}$ = AVSM CPU session management maximum capacity

$M^{MAX}_{B}$ = AVSM Bus maximum capacity

$M^{MAX}_{N}$ = AVSM Networking port maximum capacity

$C^{MAX}_{SM}$ = AVSC CPU session management maximum capacity

$C_{P}^{MAX}$ = AVSC CPU process maximum capacity

$C_{B}^{MAX}$ = AVSC Bus maximum capacity

$C_{DC}^{MAX}$ = AVSC Disk Controller/disk bus maximum capacity

$C_{RW}^{MAX}$ = AVSC Disk read/write/seek maximum capacity

$C_{N}^{MAX}$ = AVSC Networking port maximum capacity

$C_{EH}^{MAX}$ = AVSC Encoder hardware maximum capacity

$C_{DH}^{MAX}$ = AVSC Decoder hardware maximum capacity

The amount of resource required by a potential combination of granted sessions would be determined, in many cases, by the sum of the total allocated resource estimates. Overhead can be included, for example, via the incorporation of a plurality of overhead constants that include the folloiwng:

$M_{SM}^{OH}$ = AVSM CPU session management overhead

$M_{B}^{OH}$ = AVSM Bus overhead

$M_{N}^{OH}$ = AVSM Networking port overhead

$C_{SM}^{OH}$ = AVSC CPU session management overhead

$C_{P}^{OH}$ = AVSC CPU process overahead

$C_{B}^{OH}$ = AVSC Bus overhead

$C_{DC}^{OH}$ = AVSC Disk Controller/disk bus overhead

$C_{RW}^{OH}$ = AVSC Disk read/write/seek overhead

$C_{N}^{OH}$ = AVSC Networking port overhead

Overhead may also be treated as a linear function of the number of various session types. Incorporation of overhead results in the supportable operating states forming a lattice of points within a convex hull defined by the intersection of hyperplanes defined by the resource capacity bound inequalities. For example, with:

$n^E$ = number of encoding sessions
$n^D$ = number of decoding sessions
$n^{PF}$ = number of put file transfer sessions
$n^{GF}$ = number of get file transfer sessions
$n^{SS}$ = number send streaming sessions
$n^{RS}$ = number of receive streaming sessions

then the supportable operating states in an implementation could be given by the following constraints:

For each AVSM 160 (typically one per AVSS 100),

- AVSM CPU capacity (session management)

$$[\, n^E M^E_{SM} + n^D M^D_{SM} + n^{PF} M^{PF}_{SM} + n^{GF} M^{GF}_{SM} + n^{SS} M^{SS}_{SM} + n^{RS} M^{RS}_{SM} \,] + M^{OH}_{SM} \le M^{MAX}_{SM}$$

- AVSM bus capacity:

$$[\, n^E M^E_{B} + n^D M^D_{B} + n^{PF} M^{PF}_{B} + n^{GF} M^{GF}_{B} + n^{SS} M^{SS}_{B} + n^{RS} M^{RS}_{B} \,] + M^{OH}_{B} \le M^{MAX}_{B}$$

- AVSM Networking port capacity:

$$[\, n^E M^E_{N} + n^D M^D_{N} + n^{PF} M^{PF}_{N} + n^{GF} M^{GF}_{N} + n^{SS} M^{SS}_{N} + n^{RS} M^{RS}_{N} \,] + M^{OH}_{N} \le M^{MAX}_{M}$$

For each AVSC 120 (at least one, typically multiple, per AVSS 100):

- AVSC CPU capacity (session management):

$$[\, n^E C^E_{SM} + n^D C^D_{SM} + n^{PF} C^{PF}_{SM} + n^{GF} C^{GF}_{SM} + n^{SS} C^{SS}_{SM} + n^{RS} C^{RS}_{SM} \,] + C^{OH}_{SM} \le C^{MAX}_{SM}$$

- AVSC CPU processes capacity:

$$[\, n^E C^E_{MP} + n^D C^D_{MP} + n^E C^E_{CP} + n^D C^D_{CP} + n^{PF} C^{PF}_{TP} + n^{GF} C^{GF}_{TP} + n^{SS} C^{SS}_{SP} + n^{RS} C^{RS}_{SP} \,]$$

$$+ \; C^{OH} \leq C_{CP}^{MAX}$$

- AVSC Bus capacity:

$$[\, n^{E} C_{B}^{E} + n^{D} C_{B}^{D} + n^{PF} C_{B}^{PF} + n^{GF} C_{B}^{GF} + n^{SS} C_{B}^{SS} + n^{RS} C_{B}^{RS} \,] + C_{B}^{OH} \leq C_{B}^{MAX}$$

- AVSC Disk controller/disk bus capacity:

$$[\, n^{E} C_{DC}^{E} + n^{D} C_{DC}^{D} + n^{PF} C_{DC}^{PF} + n^{GF} C_{DC}^{GF} + n^{SS} C_{DC}^{SS} + n^{RS} C_{DC}^{RS} \,] + C_{DC}^{OH} \leq C_{DC}^{MAX}$$

- AVSC Disk read/write/seek capacity:

$$[\, n^{E} C_{RW}^{E} + n^{D} C_{RW}^{D} + n^{PF} C_{RW}^{PF} + n^{GF} C_{RW}^{GF} + n^{SS} C_{RW}^{SS} + n^{RS} C_{RW}^{RS} \,] + C_{RW}^{OH} \leq C_{RW}^{MAX}$$

- AVSC Networking port capacity:

$$[\, n^{E} C_{N}^{E} + n^{D} C_{N}^{D} + n^{PF} C_{N}^{PF} + n^{GF} C_{N}^{GF} + n^{SS} C_{N}^{SS} + n^{RS} C_{N}^{RS} \,] + C_{N}^{OH} \leq C_{N}^{MAX}$$

- AVSC hardware:

$$[\, n^{E} C_{EH}^{E} \,] \leq C_{EH}^{MAX}$$

$$[\, n^{D} C_{DH}^{D} \,] \leq C_{DH}^{MAX}$$

Here it is assumed that each encode session is represented with either a fixed or an average amount of disk capacity. Depending upon design choices, one embodiment may enforce a per-session file size limit, while another embodiment may permit file size overruns.

Upon receiving one or more requests for services, the AVSM 160 would, for example, perform the following evaluations:

· serialize any multiple pending requests so the following evaluations are done fully separately in sequence for each pending request;

· check if accepting the new request would not exceed the AVSM's own capacity requirements; and

· check all AVSCs 120 within that AVSS 100 to see if at least one AVSC 120 could accept the new request without exceeding the AVSM's own capacity requirements (this

could be done via either the AVSM's own image of the AVSC states or by polling at least one AVSC 120).

- If more than one AVSC 120 can support the request:
- select one according to a conventional procedure such as first available, round robin, or operating lifetime;
- allocate the session to the AVSC 120, ensuring directly or indirectly notification of the requesting application and the invocation of appropriate network connections; or
- otherwise, deny the request.

Clearly there are many other possible implementations. The range of possible implementations could also include methods for ensuring that no single type of application or type of session monopolizes the AVSS 100 at the exclusion of other types of applications or sessions. In the previous illustrative example, this could be accomplished by adding further inequalities to the list above. For example, the total number of file transfer sessions can be limited by adding the constraint

$$n^{PF} + n^{GF} \leq n^{F:MAX}$$

whered $n^{F:MAX}$ is the maximum number of simultaneous file transfers allowed.

The device management services additionally include AVSC validation operations, through which the AVSM 160 queries each AVSC 120 to determine the number, type, and capabilities of the AVSC's storage, encoding, decoding, and transcoding resources. The AVSM 160 uses the query results to update the AVSS database if needed, and further logs any discrepancies as well as the types of operations undertaken in response.

### 4.7.6 Administrative Services

The AVSM 160 also performs or manages the performance of administrative services that include system performance and utilization monitoring; system diagnostics; event capture operations; billing operations; password maintenance operations; and user maintenance operations.

## 4.8 Software Architecture And System Interface

### 4.8.1 Communication Class Hierarchy

In the present invention, the manners in which AVSS-external and AVSS-internal clients may access AVSM, AVSC, and A/V network manager functionality are defined by a set of software communication class hierarchies. ***Figure*** 15 is a block diagram showing a high-level AVSS communication class hierarchy 200 for one embodiment of the present invention. As shown in ***Figure*** 15, the base class for this hierarchy is referred to as "Comm," which serves as a basis for AVSS-external and AVSS-internal client communication. The Comm class also serves as a basis for external and internal A/V network manager client communication, and is described in detail in U.S. Patent No. 5,617,539.

Several subclasses derived from the Comm class encapsulate particular aspects of AVSS functionality for AVSS-external and AVSS-internal client access. These subclasses include the following:

1) AvnmComm - the AvnmComm class provides access to functionality supported through its parent class, as well as client access to A/V network manager services.

1) AvsComm - the AvsComm class provides access to AVSS functionality that includes login authorization; A/V encoding, decoding, and transcoding; file transfer between AVSCs 120; file importing and exporting; file and directory management; and AVSC configuration and status reporting.

2) AvscComm - the AvscComm class provides access to the functionality supported through its parent class, and in addition provides client and server access to additional AVSC-related services as detailed below.

3) AvscAppComm - the AvscAppComm class provides a client interface for accessing file import and export services.

4) AvsmComm - the AvsmComm class provides access to the functionality supported through its parent class, and in addition provides client and server access to the AVSM file and device management services described above.

5) AvsmAppComm - the AvsmAppComm class provides event handlers that support client application program access to AVSS services.

6) AvsmAdminComm - the AvsmAdminComm class provides AVSS-external and AVSS-internal clients access to AVSS administrative functionality.

### 4.8.2 AVSM Class Relationship

The classes of AVSM objects resident within the AVSM object memory 172 have a hierarchical class relationship. ***Figure*** 16 is a block diagram of an AVSM class relationship 250 organized in accordance with one embodiment of the present invention. The AVSMManager class comprises comprises a container class for supporting session establishment, session management, and session termination operations. The AVSMManager class further includes parameters and methods for facilitating AVSM operation, i.e., implementing the AVSM 160. The AVSMManager class also contains parameters specifying AVSS operational characteristics, such as AVSC session limits, plus port and connection information for premises AVSCs 120, the A/V network manager 34, and known non-premises AVSSs 100. In one embodiment, the AVSMManager class includes methods that facilitate communication between lower-level classes within the AVSM class hierarchy 250.

An AVSMComm class provides a software infrastructure for implementing a server interface that manages client interactions, where clients include user application programs and/or a non-premises AVSS 100. The AVSMComm class also provides a basis that allows the AVSM 160 to behave as a client relative to non-premises AVSSs 100. The AVSMComm class comprises methods for retrieving requests, building objects that are subclassed according to request type, and dispatching requests. The AVSMComm class further comprises methods for receiving replies, building objects subclassed according to reply type, and issuing replies. The AVSMComm class includes a reference to an AVSMRequestList class and an AVSMReplyList class.

The AVSMRequestList class facilitates the implementation of a queue for requests received from AVSS-external clients, as well as a queue for requests directed to non-premises AVSSs 100. The AVSMRequestList class comprises a reference to an AVSMRequest class, which comprises request parameters as well as methods for accessing data associated with a request. In one embodiment, the AVSMRequest class is subclassed according to request type. Thus, a request queue may include a first reference

to an AVSMOpenRequest object that corresponds to an A/V file open request received from a client; and a second reference to an AVSMPlayRequest object that corresponds to an A/V file playback request received from a client.

The AVSMReplyList class facilitates the implementation of a queue for replies directed from the AVSM 160 to external clients, as well as a queue for replies received from non-premises AVSSs 100. The AVSMReplyList class comprises a reference to an AVSMReply class, where the AVSMReply class comprises reply parameters as well as a set of methods for accessing data associated with a reply. In a manner analogous to that for the AVSMRequest class, the AVSMReply class may be subclassed in accordance with reply type.

An AVNMComm class provides a software infrastructure for implementing an A/V network client interface that includes parameters and methods for issuing requests to and receiving replies from the A/V network manager 34. The AVNMComm class includes a reference to an AVNMRequestList class and an AVNMReplyList class. The AVNMRequestList class facilitates the implementation of a queue for requests directed to the A/V network manager 34, and comprises a reference to an AVNMRequest class. The AVNMRequest class includes parameters corresponding to a request directed to the A/V network manager 34, as well as methods for accessing data associated with the request. The AVNMRequest class may be subclassed in accordance with the type of request directed to the A/V network 30. The AVNMReplyList class facilitates the implementation of a queue for replies received from the A/V network manager 34, and includes a reference to an AVNMReply class. The AVNMReply class comprises parameters associated with replies received from the A/V network manager 34, as well as methods for accessing any data associated therewith. The AVNMReply class may be subclassed in accordance with the types of a replies that may be received from the A/V network manager 34.

An AVSCComm class comprises a software infrastructure for implementing an AVSC client interface, and comprises parameters and methods for issuing requests to and receiving replies from AVSCs 120. The AVSCComm class includes a reference to an AVSCRequestList class, which facilitates implementation of a queue for requests directed

to AVSCs 120. The AVSCRequestList class includes a reference to an AVSCRequest class, which includes parameters and methods for generating requests directed to an AVSC 120, and which may be subclassed in accordance with the types of requests that may be directed to AVSCs 120. The AVSCComm class also includes a reference to an AVSCReplyList class, which facilitates implementation of a queue for replies received from AVSCs 120. The AVSCReplyList class includes a reference to an AVSCReply class, which comprises parameters and methods associated with receipt of AVSC replies. The AVSCReply class may be subclassed in accordance with AVSC reply types.

A CellList class serves as a basis for a list that describes each premises AVSC 120. The CellList includes a reference to a Cell class, which provides a basis for describing an AVSC 120. The Cell class includes parameters that specify a network address, bandwidth capabilities, and a number of simultaneous requests that the AVSC 120 can process. The Cell class further includes references to a ListDisks class, a ListEncoders class, a ListDecoders class, and a ListTranscoders class.

The ListDisks class facilitates creation of a list that references a Disk class, which supports an AVSC storage device description. The Disk class contains parameters that include such information as device transfer rate, seek time, and available storage space. The Disk class additionally contains methods for accessing and modifying such parameters.

The ListEncoders class facilitates the implementation a list that references an Encoder class, which supports an AVSC encoder description. Encoder class parameters include such information as encoder type, bandwidth and I/O limitations, supported media formats, and input signal characteristics. The Encoder class additionally contains methods for accessing and modifying these parameters.

The ListDecoders class facilitates the implementation of a list that references a Decoder class, which supports an AVSC decoder description. Decoder class parameters include such information as decoder type, bandwidth and I/O limitations, supported media formats, and output signal characteristics. The Decoder class additionally contains methods for accessing and modifying the Decoder class parameters.

The ListTranscoders class facilitates the implementation of a list that references a Transcoder class, which supports an AVSC transcoder description. Transcoder class parameters include such information as transcoder type, bandwidth and I/O limitations, supported media formats, and input/output signal characteristics. The Transcoder class additionally contains methods for accessing and modifying the Transcoder class parameters.

A LoginList class provides an implementation basis for a list describing currently logged-in users. The LoginList class references a Login class that supports a user description via parameters that include a user ID, a privilege level, a login date and time stamp, and a set of channel handles currently allocated to the user ID, where each channel handle corresponds to AVSC resources allocated to processing user requests as described in detail below.

A SessionList class serves as basis for a list that describes currently active sessions. The SessionList class references a Session class, which provides a foundation for describing any particular session. The Session class is subclassed according to session type, where the subclasses include CopySession, PublishSession, ImportSession, ExportSession, AVSession, FileSession, and ListSession classes.

The CopySession class provides a framework for describing and tracking a file copy operation between two AVSCs 120. The CopySession class includes parameters such as IP or network addresses for the AVSCs 120 involved, a source and a destination filename, and channel handles corresponding to resources reserved on the AVSCs 120 for performing the file copy operation. In one embodiment, the CopySession class parameters also include a flag that specifies whether a copy operation or a transfer operation is required, where the transfer operation comprises file copying followed by deletion of the file from an origin AVSC 120. The CopySession class further includes methods for accessing its parameters.

The PublishSession class comprises parameters and methods that describe and monitor A/V and/or multimedia document publishing operations, through which A/V and/or multimedia files may be copied to non-AVSS servers. PublishSession class parameters include IP or network addresses plus login data for a target or destination

server, as well as a filename. PublishSession class methods includes data conversion and data transfer methods. The PublishSession class may be subclassed in accordance with particular media formats, where such subclasses include parameters such as destination server type and transcoding requirements. Exemplary subclasses include a NetShowPublish class and a RealMediaPublish class.

The ImportSession class comprises parameters and methods that describe and monitor the reading of A/V file data into a target AVSC 120 from a source client application (or source workstation 40 or other computer upon which the client application is executing), and includes parameters specifying the target AVSC's IP or network address and an AVSC channel handle. The ExportSession class provides a basis for writing A/V file data from the AVSC 120 into a target client application program (or target workstation 40 or other computer upon which the client application program is running), and includes parameters specifying the source AVSC's IP or network address and an AVSC channel handle.

The AVSession class comprises parameters and methods for initiating and managing A/V operations, which may include record, play, stream-in, stream-out, pause, resume, status, and stop operations.

The FileSession class comprises parameters and methods that facilitate writing data to and reading data from an AVSC 120. The ListSession class comprises parameters and methods that facilitate the generation of a list that specifies files and file attributes stored upon one or more AVSCs 120.

An AVMFileList class provides a basis for implementing the AVSM file parameter list within the AVSS database. The AVMFileList includes a reference to an AVMFile class, which includes parameters describing an A/V file, such as filename, file author or creator, a file title and description, file size, encoding type, and playback duration. The AVMFile class further includes a reference to an OwnerList class, which in turn references an Owner class. The Owner class provides a basis for describing an A/V file owner, and includes parameters such as user ID, a last access date and time, and an ownership expiration date. The OwnerList class includes methods for adding and deleting owners.

Those skilled in the art will understand that the AVSM class hierarchy 250 can be readily modified or extended to provide or accommodate access to additional types of AVSM functionality.

### 4.8.3 AVSC Class Relationship

In a manner similar to that for the AVSM objects, the AVSC objects resident within the AVSC object memory 152 are hierarchically interrelated. ***Figure*** 17 is a block diagram of an AVSC class relationship 300 organized in accordance with one embodiment of the present invention. In the AVSC class relationship 300, a MediaResource class serves as a container class for implementing multithreaded AVSC functionality, and includes methods for thread management. An AVSCComm class provides a software infrastructure for implementing an AVSC communication port. The AVSCComm class provides a basis for implementing a server that receives requests and issues replies, as well as a client that issues requests and receives replies. Typically, an AVSC 120 will act as a server the majority of the time; however, the AVSC 120 may act as a client during AVSC-to-AVSC file copy or transfer operations. The AVSCComm class comprises parameters and methods for retrieving requests, building objects that are subclassed according to request type, and dispatching requests. In one embodiment, request dispatch occurs via the creation of a thread of execution corresponding to a request. The AVSCComm class includes references to an AVSCRequestList class and an AVSCReplyList class.

The AVSCRequestList class provides a basis for implementing a request queue, and references an AVSCRequest class. The AVSCRequest class facilitates request description, and may be subclassed in accordance with request type. The AVSCReplyList class provides a basis for implementing a reply queue, and references an AVSCReply class, which may be subclassed according to reply type.

A MessageThreadList class facilitates implementation of a list of threads that are currently active within the AVSC 120, and references a MediaThread class. The MediaThread class provides a framework for implementing a thread of execution that processes and fulfills a request. The MediaThread class includes thread parameters such as a thread ID and thread state information. The parameters may further include a

filename, a password, and an IP or network address. The MediaThread class references a MediaMessage class. The MediaMessage class comprises parameters and methods that direct thread execution, and is subclassed according to thread type.

In the context of the AVSC class relationship 300, a "channel" comprises a group of resources allocated for performing a particular type of operation, such as an A/V file playback or record operation. A ChannelList class facilitates the implementation of a list that identifies or describes a current set of channels within the AVSC 120. The ChannelList class references a MediaChannel class, which comprises a container class for representing a channel. The MediaChannel class selectively includes references to an Encoder class, a Decoder class, a Transcoder class, a Buffer class, a DiskAccess class, and a NetAccess class. The Encoder class provides a basis for describing and controlling an encoder within the AVSC 120, and includes parameters specifying encoder type, supported quality levels, whether the encoder is busy or available, and methods that communicate with a set of software drivers that control encoder hardware. The Decoder class serves as a basis for describing and directing the operation of a decoder within the AVSC 120, and includes parameters specifying decoder type, supported quality levels, availability, and methods that communicate with software drivers that control decoder operation. Similarly, the Transcoder class serves as a basis for describing and directing the operation of a transcoder within the AVSC 120, and includes parameters specifying transcoder type, supported source and target coding formats, availability, and methods that communicate with software drivers that control transcoder operation. The Buffer class comprises parameters and methods that facilitate the implementation of memory and/or disk buffers, where such parameters may include buffer type, size, and fill level, and such methods may include program instructions for reading from and writing to the buffer. Finally, the NetAccess class serves as a basis for managing data exchange between the AVSC 120 and the AVSS internal network 110. Each of the Encoder, Decoder, Buffer, DiskAccess, and NetAccess classes may be subclassed in accordance with the particular nature of the resources to which they correspond.

The MediaChannel class also includes a reference to a MediaFile class, which serves as a wrapper for providing an interface to particular functionality and AVSC

resources allocated for the channel. The MediaChannel additionally includes a reference to a MessageThreadList class, which facilitates implementation of a list that identifies threads currently active within the scope of the channel.

An EncoderList class within the AVSC class relationship 300 serves as a basis for implementing a list that identifies the encoders within the AVSC 120. The EncoderList class includes a reference to the aforementioned Encoder class. Similarly, a DecoderList class serves as a basis for implementing a list identifying the decoders within the AVSC 120. The DecoderList class includes a reference to the Decoder class. A TranscoderList class facilitates implementation of a list identifying the transcoders within the AVSC 120. The TranscoderList class also references the Transcoder class. A BufferList class facilitates implementation of a list that indicates buffer allocation within the AVSC 120, and includes a reference to the Buffer class. A DiskAccessList class facilitates implementation of a list specifying allocation of storage devices within the AVSC 120, and includes a reference to the Disk class. Finally, a NetAccessList class facilitates implementation of a list of allocated network access resources, and includes a reference to the NetAccess class.

As with the AVSM class relationship 250, those skilled in the art will understand that the AVSC class relationship 300 can be readily modified or extended to provide or accommodate access to additional types of AVSC functionality.

### 4.9 Client And Server Communication

In the present invention, an AVSS-external or AVSS-internal client requiring a service accessed via an instance of a target object calls for the service by issuing a request. In response, the target object may perform one or more portions of the required service, act as a client and issue one or more requests to other objects, and/or issue one or more messages. Upon service completion, the target object issues a reply. Thus, from a hierarchical perspective, the issuance of a high-level request may give rise to the issuance of one or more lower-level requests and replies, followed by the issuance of a high-level reply. Each such request and reply in one embodiment of the present invention is exchanged in accordance with a conventional Internet Protocol (IP) suite, in a manner readily understood by those skilled in the art.

### 4.10 AVSM Request Categories

The requests understood by the AVSM 160 span several categories, which in one embodiment include the following:

#### 4.10.1 External Client to AVSS Requests

Requests that may be used by AVSS-external clients requiring access to AVSS services include the following:

a) Login - initiates a login session with the AVSS 100 and provides user information and associated A/V network service information to the AVSM 160, where the user information includes a user ID and a password.

b) Logout - terminates user interaction with the AVSS 100.

c) GetFileLimits - returns current administered and physical limits on the length of an A/V file to be encoded.

d) AcquireAVChannel - establishes a session by reserving particular AVSC resources for performing specified types of operations, such as encoding, decoding, transcoding, and/or streaming. Specifies a source AVSC resource and at least one destination AVSC resource to flexibly support multiple modes of operation, which include the following:

1) Playback mode - facilitates playback of an A/V file residing upon an AVSC storage device to a user workstation 40, where such playback can occur at a specified speed or playback rate.
   Source resource = disk, destination resource = decoder.
2) Preview mode - facilitates recording setup and record preview operations involving a user workstation 40 (i.e., A/V signal "loop through" without storage of A/V signals to disk).
   Source resource = encoder, destination resource = decoder.
3) Record mode - facilitates A/V signal recording from a user workstation 40 to generate an A/V file upon an AVSC storage device.
   Source resource = encoder, destination resource = disk.

4) Playback-while-recording mode - facilitates A/V signal recording from a user workstation 40 with simultaneous A/V signal playback to the user workstation 40.
Source resource = encoder, destination resources = disk and decoder.

5) Broadcast-to-network mode - facilitates broadcast of A/V signals from a user workstation 40 to a network (i.e., the AVSS internal network 110 or the data network 20).
Source resource = encoder, destination resource = network.

6) Broadcast-and-playback mode - facilitates A/V signal broadcast from a user workstation 40 to a network, with simultaneous A/V signal playback to the user workstation 40.
Source resource = encoder, destination resources = network and decoder.

7) Broadcast-while-recording mode - facilitates broadcast to a network while performing A/V signal recording from a user workstation 40 to an AVSC storage device.
Source resource = encoder, destination resources = disk and network.

8) Broadcast-with-record-and-playback mode - facilitates broadcast to a network while recording A/V signals from a user workstation 40 to AVSC storage device and simultaneously playing A/V signals back to the user workstation 40.
Source resource = encoder, destination resources = network, disk, and decoder.

9) Stream-in-to-disk mode - facilitates receiving a data stream from a network to an AVSC storage device.
Source resource = network, destination resource = disk.

10) Stream-in-to-playback mode - facilitates data streaming from a network to a user workstation 40 via AVSC decoder.

Source resource = network, destination resource = decoder or transcoder.

11) Stream-in-to-playback-with-save mode - facilitates data streaming from a network to a user workstation 40, and saves data being streamed in to an AVSC storage device.
Source resource = network, destination resource = decoder or transcoder and disk.

12) Stream-out-to-network mode - facilitates data streaming from an AVSC storage device to a network at a specified streaming rate.
Source resource = disk, destination resource = network.

13) Stream-out-to-network-and playback-mode facilitates data streaming from an AVSC storage device to a network at a specified streaming rate with simultaneous A/V signal playback to the user workstation 40.
Source resource = disk, destination resource = network and decoder

Those skilled in the art will understand that a buffer resource upon an AVSC may be included as an intermediate destination resource for several types of operational modes, for example, those involving streaming. Those skilled in the art will additionally understand that many other modes of operation exist, for which a session may be established and resources may be reserved in a manner analogous to that described above. When appropriate (i.e., depending upon the specified mode of operation), the AcquireAVChannel request also specifies parameters such as a filename and password; A/V file encoding type; and/or a minimum frame count that indicates an amount of storage space that must be available upon a storage device. After successful resource reservation, a reply corresponding to AcquireAVChannel (i.e., an AcquireAVChannelReply) returns a session handle to a requesting client.

e) AcquireDataChannel - establishes a session and reserves AVSC resources for particular types of file transfer operations, including copy-to, copy-from, file query, and file listing operations. This request includes parameters specifying a mode such as read-only or read-write, as well as parameters such as a filename, password, and a minimum

amount of storage space that must be present upon an AVSC storage device. After AVSC resource reservation, a reply corresponding to AcquireDataChannel returns a session handle.

f) AcquireAVFileImportChannel - establishes a session for importing an A/V file into the AVSS 100 and returns a session handle and the network or IP address of the AVSC 120 that will initially receive the A/V file.

g) AcquireAVFileExportChannel - establishes a session for exporting an A/V file from the AVSS 100 to the client and returns the network or IP address of the AVSC 120 upon which the file is stored, plus a session handle.

h) AcquirePublishChannel - establishes a session for publishing an A/V file from an AVSC 120 to one or more non-AVSS target servers. Parameters specified include a filename and password, as well as target server type. A reply associated with this request returns a session handle.

i) PublishFile - publishes a file to a non-AVSS target server. Specified parameters include a filename and password, a target server network or IP address, and target server login and password information.

j) RequestPublishLocations - given a specified filename and password, returns known non-AVSS target server identification and network or IP address to which a file has previously been published, as indicated by the AVSS database.

k) DeletePublishedFile - given a specified filename, file password, and non-AVSS target server network or IP address or target server type, deletes file's publication references for target server or target server types from the AVSS database. If target server login, login password, and any delete authorization information is also specified, DeletePublishedFile additionally attempts to delete the published file from the target server itself.

l) ReleaseAVChannel - releases the resource or resources obtained through the AcquireAVChannel, AcquireAVFileImportChannel, AcquireAVFileExportChannel, and AcquirePublishChannel requests, and deletes a corresponding session handle.

m) AVSMStatusRequest - returns status information to a client during file copy, import, export, and publishing operations when a valid session handle is specified, where

such status information may include a number of bytes transferred or an estimated amount of time remaining until operation completion.

n) GetAVFileAttributes -returns attributes for an A/V file, including application program-defined attributes. Certain restrictions may exist with regard to which attributes may be returned. For example, only a super-user and the file author may be allowed to view a complete owner list. A user may be allowed to view file attributes if the user is specified as an owner for the file, and any attributes returned are specific to that user.

Super-users and the file authors can access the following operations in one embodiment:

o) SetAVFileAttributes - sets the mutable attributes of an A/V file, including application program-defined attributes.

p) AddOwner - causes the AVSM 160 to add a specified user ID to the access privilege list corresponding to an A/V file.

q) RemoveOwner - causes the AVSM 160 to remove a specified user ID from the access privilege list corresponding to an A/V file.

r) RequestAVFile - requests an A/V file from a non-premises source AVSS 100. If AV file is present within the domain of the AVSM 160 that receives this request, a file transfer procedure retrieves the A/V file from the non-premises source AVSS 100.

### 4.10.2 Client To AVSC Via AVSM Requests

Many of the requests the AVSM 160 issues to an AVSC 120 are variants of those sent to the AVSM 160 by client application programs. Requests that the AVSM 160 may receive from external clients and forward or pass to an AVSC 120 for servicing include the following:

a) Open - depending upon a mode specifier that indicates whether an A/V file is to be operated upon relative to A/V resource processes (MEDIA mode) or file transfer processes (DATA mode), opens or creates an A/V file and prepares it for encoding, decoding, and/or transcoding, streaming in, or streaming out (MEDIA mode), or data transfer (DATA mode). Upon completion of this request, a reply is issued that includes a session handle.

b) Close - closes a file associated with a specified session handle.

c) Read - for a file opened in DATA mode, reads a specified number of bytes from the file and transfers them to the requesting client.

d) Write - for a file opened in DATA mode, transfers and writes a specified number of bytes to the file.

e) Seek - for a file opened in DATA mode, positions the file at a specified byte. For a file opened in media mode, positions the file at a specified frame.

f) Play - causes the AVSC 120 to signal a decoder to begin processing a file and feeding the output to the A/V network 30. Parameters include playback speed or rate as well as direction and processing length indicators that allow this request to implement fast-forward, rewind, or similar operations.

g) Record - causes the AVSC 120 to signal an encoder to begin saving A/V input to the file. A record length limitation may be specified.

h) StreamIn - causes the AVSC 120 to stream data from the AVSS internal network 110 into a buffer, data storage, and/or decoding resource, in accordance with resources reserved for a particular channel.

i) StreamOut - causes the AVSC 120 to stream data from a buffer, data storage, and/or encoding resource to the AVSS internal network 110 at a specified data rate, in accordance with resources reserved for a particular channel.

j) Stop - causes suspension of a current encoding, decoding, transcoding, or streaming process.

k) Status - returns current file mode and frame number if in MEDIA mode or byte position if in DATA mode.

### 4.10.3 AVSM To AVSC Requests

Requests the AVSM 160 issues to a target AVSC 120 in relation to A/V file access and file transfer include the following:

a) AcquireChannel - requests the AVSC 120 to create a channel reserving a specified encoder, decoder, and/or transcoder for use by an AVSS client. This request may additionally be used to reserve file transfer bandwidth for impending file transfer or streaming operations. Request completion results in the return of a channel handle that may be used to identify the allocated resources in subsequent operations.

b) ReleaseChannel - indicates to the AVSC 120 that the resources associated with a specified handle are no longer required and shall be released.

c) SetMediaSetup - sets or updates configuration information for the target AVSC 120. This request is typically employed in the event that the AVSC's hardware configuration has been modified.

d) GetMediaSetup - returns configuration and usage information for the target AVSC 120.

e) GetDriveInfo - returns information about a specified storage device.

f) GetMediaStatus - returns current AVSC utilization and state information.

g) Rename - renames a specified file.

h) Delete - deletes a specified file.

i) CopyTo - initiates the transfer of a specified file to a specified destination AVSC 120.

j) CopyFrom - initiates the transfer of a specified file from a specified source AVSC 120.

### 4.10.4 AVSC To AVSM Requests

An AVSC 120 may send informational requests to its managing AVSM 160 to indicate state changes associated with file transfer operations, A/V operation completion, and/or general hardware status. Such informational requests include the following:

a) PlayEnd - indicates that a current play operation has completed, due to end-of-file or a play-length being reached.

b) RecordEnd - indicates that a current record operation has completed.

c) HardwareError - indicates a hardware failure associated with a specified encoder, decoder, transcoder, or storage device.

### 4.10.5 AVSM To AVSM Requests

In addition to receiving external requests from client application programs, a premises AVSM 160 may receive requests from a non-premises AVSM 160. Typically, such requests correspond to file transfer operations, and include the following:

a) RequestAVFileSource - issued by the premises AVSM 160 to the non-premises AVSM 160 upon receipt of a "RequestAVFile" from a client. The non-premises AVSM

160 returns i) the network or IP address of an AVSC 120 that can serve as a file transfer source; ii) attributes for a specified A/V file; and iii) a channel handle.

b) NotifyAVFileSource - sent upon successful completion of an A/V file transfer between a premises and a non-premises AVSC 120, and includes the user ID and source channel handle, such that the non-premises AVSM 160 can release source AVSC resources that had been reserved for the file transfer.

### 4.10.6 AVSM Administration Requests

Several requests, some of which may be accessible only to a super-user, may be used to perform AVSS configuration and administrative operations, and include the following:

a) SetPrivileged - establishes a super-user session, through which the super-user can access many administrative functions. This request requires a password.

b) GetAVSMLogInfo - returns information stored in the AVSM event log.

c) ClearAVSMLogInfo - clears the AVSM event log.

d) SetAVSMLogLevel - specifies types of requests and events to log, as well as a level of detail for logging, and a maximum AVSM event log size.

e) ListAVSCs - returns a list of AVSCs 120 managed by the AVSM 160.

f) GetAVSCInfo - returns configuration and utilization information for a particular AVSC 120.

g) GetAVSCLogInfo - returns information stored in the AVSC event log, message queue.

h) ClearAVSCLogInfo - clears a specified AVSC's event log.

i) SetAVSCLogLevel - indicates to a specified AVSC 120 types of requests and events to log, as well as a level of detail for logging, and a maximum AVSC event log size.

j) SetAVNMInfo - updates A/V network manager information maintained within the AVSM 160.

k) AddAVSC - adds configuration information corresponding to a newly-added premises AVSC 120 to the AVSS database. Configuration information for the new AVSC 120 is obtained by querying the AVSC 120.

l) RemoveAVSC - removes information corresponding to an AVSC 120 no longer in the premises group from the AVSS database.

m) ListAVSSs - returns a network or IP address for each non-premises AVSS 100 about which the AVSM 160 is aware.

n) GetAVSSInfo - returns routing and/or connection setup information for a particular non-premises AVSS 100 known to the AVSM 160.

o) SetAVSSInfo - sets routing and/or connection setup information for a specified non-premises AVSS 100. In one embodiment, this information pertains to the host AVSM 160 for the specified AVSS 100.

p) AddAVSS - adds a specified non-premises AVSS 100 to those known to the AVSM 160. In one embodiment, routing and connection information for the newly-added AVSS 100 is specified through SetAVSSInfo.

q) RemoveAVSS - removes a non-premises AVSS 100 from those know to the AVSM 160.

r) SetAVFileLimits - sets a maximum A/V file length allowed during encoding operations.

Those skilled in the art will recognize that an AVSS could support additional or fewer requests in an alternate embodiment.

### 4.11 AVSC Request Categories

The AVSC 120 provides support for a variety of requests, including those in the following categories:

#### 4.11.1 Allocation and Authorization Requests

a) AuthorizationResource - ensures that a client requesting services provided by the AVSC 120 is either an AVSM 160 or a client providing a valid channel handle.

b) AllocateChannel - creates a channel to which specified resources are allocated, and returns a channel handle.

c) ChangeChannel - for a channel identified by a channel handle, adds or deletes specified resources to or from channel, respectively.

d) ReleaseChannel - for a channel identified by a channel handle, frees channel resources (i.e., channel resources are returned to "not busy" or "not allocated" status), removes channel from channel list, and releases channel handle.

### 4.11.2 File Management Requests

a) CopyFromChannel - establishes a copy session with a source AVSC 120 and performs file copy operations.

b) CopyToChannel - establishes a copy session with a target AVSC 120 and performs file copy operations.

c) RenameChannel - renames a specified file.

d) DeleteChannel - deletes a specified file.

e) FindFilesFirstChannel - performs file directory operations, returning first k files.

f) FindFilesNextChannel - performs file directory operations, returning next n files.

g) GetFileInfoChannel - opens a specified file and returns information about the media content of the file; this request may be employed, for example, to validate file import operations or for consistency checking.

h) PublishDigitalFileChannel - performs format conversion, login operations, and file copy operations to publish a specified file to another server in a specified format.

### 4.11.3 Media Requests

a) OpenChannel - opens a specified A/V file on a specified channel.

b) ReadChannel - reads from an A/V file on a specified channel.

c) WriteChannel - writes to an A/V file on a specified channel.

d) PlayChannel - plays an A/V file on a specified channel at a specified frame rate.

e) StreamInChannel - streams an A/V file into a specified channel.

f) StreamOutChannel - streams an A/V file from a specified channel at a specified data rate.

g) RecordChannel - records an A/V file on a specified channel.

h) PauseChannel - pauses A/V file operations on a specified channel.

i) StopChannel - stops A/V file operations on a specified channel.

j) ResumeChannel - resumes A/V file operations on a specified channel.

k) SeekChannel – moves to a given position within an A/V file on a specified channel.

l) StatusChannel - returns information about current status of operations on a specified A/V file, including current frame or position within the file, on a specified channel.

m) CloseChannel - closes an A/V file on a specified channel.

#### 4.11.4 Administrative Requests

a) InitializeResource - resets hardware, rebuilds lists, and reallocates objects.

b) GetMediaSetupResource - returns information about encoders, decoders, transcoders, and storage devices within the AVSC 120.

c) SetMediaSetupResource - sets information about encoders, decoders, transcoders, and/or storage devices within the AVSC 120.

d) GetMediaStatusResource - returns current status of AVSC resources, including a number of channels open; a number of encoders, decoders, transcoders in use; storage device usage and available storage space; and buffer and internal network usage.

e) HangupResource - performs failure recovery or system violation recovery operations.

f) ShutdownResource - performs shutdown operations, after which AVSC 120 can be reinitialized.

### 4.12 Request Sequence Examples

The description that follows details the flow of requests and replies generated in response to exemplary AVSS-external requests corresponding to several operational categories, which are defined as follows:

#### 4.12.1 Session Establishment and Resource Reservation

***Figure*** 18 is an exemplary request sequence diagram for the AcquireAVChannel request described above. In ***Figure*** 18, and AVSS client (i.e., a client application program) issues an AcquireAVChannel request specifying a mode and mode-specific parameters to its premises AVSM 160. The AVSM 160 determines a set of AVSC resources required to fulfill the channel acquisition request, and identifies an appropriate

AVSC 120. The AVSM 160 then issues an AcquireChannel request to the AVSC 120, specifying a set of resources to be reserved for a channel. Upon reserving the resources, the AVSC 120 issues an AcquireChannelReply to the AVSM 160, which includes a channel handle and a return code that indicates whether resource reservation was successful. The AVSM 160 subsequently issues an AcquireAVChannelReply that includes a session handle to the client. The client may subsequently use the session handle to request particular operations in accordance with the types of AVSC resources associated with the channel handle. For any given client, the AVSM 160 may map one or multiple session handles to a single channel and handle. The AVSM 160 is responsible for mapping session handles to the appropriate channel handle during subsequent operations. Those skilled in the art will understand that analogous operations occur for each particular type of channel acquisition request described above.

#### 4.12.2 A/V File Management

Since the AVSM 160 is responsible for maintaining the AVSS database, it must perform some processing in response to client requests affecting A/V files. Since the A/V files are physically stored upon the AVSCs 120, the AVSM 160 passes or forwards requests to the appropriate AVSC(s) 120 following such processing. In general, for AVSS clients requiring access to an A/V file, the AVSM 160 examines the AVSS database to determine whether a specified file exists, and upon which AVSCs 120 the file resides. When an A/V file is created, the AVSM 160 adds a file parameter list to the AVSS database, and selects an available AVSC 120 to support an encoding session. The AVSM 160 issues a Record request to the selected AVSC 120, updates its internal data, and upon completion of the recording operation issues a RecordReply to the client.

***Figure*** 19 is an exemplary request sequence diagram for the "Open" request described above. In ***Figure*** 19, an AVSS client (i.e., a client application program) issues an Open request specifying a session handle, a filename, and a mode (i.e., MEDIA, DATA read/write or read only) to its premises AVSM 160. The AVSM 160 subsequently maps the session handle to the appropriate AVSC channel handle, and forwards the open request to the AVSC 120 corresponding to the channel handle. After opening the A/V file, the AVSC 120 issues an OpenReply to the AVSM 160, which includes a channel handle

and a return code that indicates whether the open operation was successful. The AVSC 160 in turn replies to the AVSS client with a session handle and a return code.

*Figure* 20 is an exemplary request sequence diagram for the above-mentioned "Close" request. In *Figure* 20, an AVSS client issues a Close request that specifies a session handle and a filename to the AVSM 160. The AVSM 160 maps the session handle to the appropriate channel handle, and issues or forwards the close request specifying the channel handle and the filename to the appropriate AVSC 120. Upon completing the close operation, the AVSC 120 issues a close reply to the AVSM 160, which includes the channel handle and a return code. The AVSM 160 maps the channel handle to the appropriate session handle, and forwards the close reply to the AVSS client.

*Figure* 21 is an exemplary request sequence diagram for an A/V file "Delete" request. In response to receipt of a delete request that specifies a session handle and a fully-qualified filename from an AVSS client, the AVSM 160 determines upon which AVSCs 120 copies of the A/V file reside. The AVSM 160 then maps the session handle to a first channel handle, and forwards the delete request to a first AVSC 120 upon which such a copy resides. Once the A/V file copy is deleted, the first AVSC 120 issues a DeleteReply to the AVSM 160. The AVSM 160 then maps the session handle to a second channel handle, and forwards the AVSS client's delete request to a second AVSC 120 upon which a copy of the A/V file resides. The second AVSC 120 performs the required delete operation, and issues a DeleteReply to the AVSM 160. The AVSM 160 continues this process by mapping the session handle to a next channel handle, and forwarding the AVSS client's delete request to a next AVSC 120 storing a copy of the A/V file after receiving a DeleteReply from an AVSC 120 that had just completed the delete operation, and so on, until copies of the A/V file no longer reside upon the AVSCs 120. After the relevant AVSCs 120 have deleted the appropriate A/V file copies, the AVSM 160 updates the AVSS database 176 to reflect the deletion, and issues a DeleteReply to the AVSS client.

### 4.12.3 Encoding, Decoding, Or Transcoding Control

*Figure* 22 is an exemplary request sequence diagram for a "Record" request. Upon receiving a Record request from an AVSS client specifying a session handle and possibly a filename depending upon operational mode, the AVSM 160 maps the session

handle to the appropriate channel handle. The AVSM 160 forwards the mapped record request to the AVSC 120, which issues commands to the encoder associated with the channel handle. When the recording session is complete, the AVSC 120 issues a RecordReply that specifies the channel handle and a return code to the AVSM 160. The AVSM 160 then maps the channel handle to a session handle, and forwards the RecordReply to the AVSS client, where the RecordReply includes the session handle and a return code.

#### 4.12.4 File Transfer

Externally-generated file transfer requests may result in the generation of multiple intra-AVSS requests and replies, depending upon the location of the requested file. ***Figure*** 23 is an exemplary request sequence diagram corresponding to a request for a file transfer from a non-premises AVSS 100. To take advantage of the file transfer capabilities of the AVSS 100, a client must have a source AVSM name or address as well as a filename. The client supplies these parameters to its premises AVSS 100 via a RequestAVFile request.

The premises AVSM 160 determines whether the required file is locally available, that is, whether it is stored upon one of the premises AVSCs 120. If not, the premises AVSM 160 issues a RequestAVFileSource request to the non-premises AVSS 100. Via an AcquireChannel request, the non-premises AVSM 160 allocates resources in an AVSC 120 that can serve as a source for the file transfer. After the non-premises AVSC 120 resources have been allocated, it replies to the non-premises AVSM 160 with an AcquireChannelReply. The non-premises AVSM 160 then replies to the premises AVSM 160 by issuing a RequestAVFileSourceReply that specifies the location or network or IP address and channel handle of the allocated non-premises AVSC 120.

The premises AVSM 160 issues an AcquireChannel request to allocate a channel and corresponding resources on a premises AVSC 120 for performing the file transfer operation, and in response receives an AcquireChannelReply that specifies a channel handle. The premises AVSM 160 then issues a CopyFrom request to the premises AVSC 120, where the CopyFrom request includes the source AVSC's location or address and channel handle. The premises AVSC 120 initiates the file transfer by issuing an Open request to the source AVSC 120, where the Open request specifies that the file is to be

opened in DATA mode. Upon receiving an OpenReply from the source AVSC 120, the premises AVSC 120 issues a series of Read requests to the source AVSC 120, which result in the file transfer. For each such Read request, the source AVSC 120 performs a read operation and issues a ReadReply to the premises AVSC 120.

After the file has been transferred, the premises AVSC 120 issues a Close request to the source AVSC 120. The source AVSC 120 closes the file, and issues a CloseReply to the premises AVSC 120, which in turn issues a CopyFromReply to the premises AVSM 160. The premises AVSM 160 next issues a ReleaseChannel request to the premises AVSC 120 to release resources associated with the copy operation, after which the AVSC 120 issues a ReleaseChannelReply. The premises AVSM 160 subsequently updates the AVSS database 176 to reflect the presence of the new file. The premises AVSM 160 next sends a NotifyAVFileSource message to the non-premises or source AVSM 160 to indicate to the non-premises AVSM 160 that the transfer is complete. The non-premises AVSM 160 issues a ReleaseChannel request to the source AVSC 120, which releases resources reserved for the copy operation and generates a ReleaseChannelReply directed to the non-premises AVSM 160. The non-premises AVSM 160 then issues a NofityAVFileSourceReply to the premises AVSM 160. Finally, the premises AVSM 160 sends a RequestAVFileReply to the AVSS client that required the file transfer operation.

**4.12.5 File Replication**

Once a new A/V file resides upon an AVSC 120, the AVSM 160 may issue a series of requests to perform A/V file replication operations. In one embodiment, A/V file replication is required in the event that more than one owner is specified in the file's access privilege list. File replication would thus be performed, for example, after or as part of processing an "AddOwner" request received from a client application program. In another embodiment, A/V file replication is performed even if an A/V file has only one owner, such that a given A/V file resides upon at least two premises AVSCs 120. This approach would enhance system reliability or fault tolerance. In such an embodiment, file replication would occur, for example, following a file transfer operation as described above with reference to ***Figure*** 23.

*Figure* 24 is an exemplary request sequence diagram corresponding to file replication operations. The AVSM 160 could perform file replication operations, for example, following issuance of a RequestAVFile reply to an AVSS client indicating completion of file transfer operations as previously described. To initiate file replication operations, the AVSM 160 issues a first AcquireChannel request to the AVSC 120 upon which the file resides, that is, the source AVSC 120. After receiving an AcquireChannelReply, the AVSM 160 issues a second AcquireChannel request to a destination AVSC 120 to which the file will be copied. Once the AVSM 160 receives an AcquireChannelReply from the destination AVSC 120, it issues a CopyFrom request to this AVSC 120. The destination AVSC 120 then sends the source AVSC 120 an Open request. Upon receiving an OpenReply, the destination AVSC 120 send the source AVSC 120 a series of Read requests, which result in transfer of the file from the source to the destination AVSC 120. After the source AVSC 120 has responded to a given Read request, it issues a ReadReply to the destination AVSC 120. Upon responding to a last Read request and issuing a last ReadReply, the destination AVSC 120 sends a Close request to the source AVSC 120, which closes the file and issues a CloseReply to the destination AVSC 120. The destination AVSC 120 subsequently issues a CopyFromReply to the AVSM 160. The AVSM 160 then issues a ReleaseChannel request to the destination AVSC 120, and in turn receives a ReleaseChannelReply. According to the particular file replication strategy employed, the AVSM 160 may repeat the destination AVSC 120 selection, AcquireChannel, CopyFrom, and ReleaseChannel procedures described above for one or more other destination AVSCs 120. The AVSM 160 could also select either AVSC 120 upon which a copy of the file currently resides as the source AVSC 120. Once any given AVSC's role as a file source is completed, the AVSM 160 issues a ReleaseChannel request to that source AVSC 120, which in turn releases resources reserved for performing the copying operations and generates a ReleaseChannelReply directed to the AVSM 160. Those skilled in the art will understand that the file replication operations could be performed via CopyTo requests rather than CopyFrom requests.

### 4.12.6 AVSS Administration

The AVSM 160 maintains data corresponding to AVSC 120 resources and their capabilities. The AVSM may query an AVSC 120 when requested, or as part of an AVSS database update when a new AVSC 120 has been added to the premises group. ***Figure*** 25 is an exemplary request sequence diagram corresponding to new AVSC addition and AVSC query requests. In response to an authorized client's issuance of an AddAVSC request specifying an AVSC 120 and a network or IP address, the AVSM 160 issues a GetMediaSetup request to the AVSC 120. The AVSC 120 generates a GetMediaSetupReply, and provides data describing its resource types, capabilities, and characteristics to the AVSM 160. The AVSM 160 then issues an AddAVSCReply to the requesting client. In response to a GetAVSCInfo request from the client, the AVSM 160 provides data describing the AVSC's resource types, capabilities, and characteristics to the client via a GetAVSCInfoReply.

## 4.13 Application Program Interface

Application programs executing on user workstations 40 or other computers act as clients relative to the AVSM 160, and may further act as clients relative to the A/V network manager 34. ***Figure*** 26 is a block diagram showing client application programs communicating with the AVSM 160 and A/V network manager 34. In one embodiment, a typical application program comprises a user interface plus a set of software objects based upon or derived from the AVSMAppComm class hierarchy 250 described above. The application program thus serves as a software wrapper that can act as an AVSM client to provide access to particular types of AVSS functionality.

In response to particular user selections or actions, an application program issues requests to the AVSM 160. Based upon replies received from the AVSM 160, the application program selectively updates information presented to the user. Since a portion of the application program comprises objects corresponding to the AVSMAppComm, communication between the AVSM 160 and the application program occurs in a manner analogous to AVSM-to-AVSM communication. Additionally, since the AVSMAppComm can be readily extended or modified to reflect the evolution of AVSM functionality over

time, new types of functionality can be readily accommodated with minimal application program modification.

### 4.14 Process and Data Primitives

The video storage server can support several types of applications. One of the ways that the several supported applications can share information, as well as cutting down on the coding required to embody the applications, is to share a set of common "primitive" elements between the several applications.

Primitives of the same class are combinable to achieve a specified result. One or more primitives may be combined to form new higher level primitives, which may in turn define yet another even higher level primitive, substantially *ad infinitum*. There are two broad classes of primitives: process primitives and data primitives.

Process primitives are invoked to perform an action. In turn, they may invoke other actions, including invoking other primitives. Typically process primitives establish AVSS sessions of some type, (for instance at least one of playing a file, getting file lists), present the user with a graphical interface, establish network connections, as well as other operations such as rendering synchronized graphics. Examples of process primitives taught by the principles of the present invention are viewers, browsers, and administrative processes.

Process primitives can be organized in a number of manners. A first manner is as a stand-alone process directly launched by a user. Alternatively, they may be launched *from within* another process, for instance a dynamic linked library or DLL. In this case, their thread of execution exists with the thread of execution of the launching process, and also terminates therewith. As a further alternative, process primitives may be launched *by* another process, as a *separate* process, whose thread of execution is not tied to the launching process. In this latter case, the termination of the launching process has no effect on the life of the process primitive.

There are several broad mechanisms for executing process primitives. One process primitive execution methodology implements the direct invocation of the process primitive by the application user. Another process primitive execution methodology is utilized where a target application, including but not limited to third-party software applications,

has previously been taught how to display or act upon the receipt of a data primitive in the form of an attachment, MIME type, file type and so forth. The receipt of the data primitive causes the target application, for instance the MIME compliant software application or the operating system, to launch a process primitive associated with the data primitive. Yet another methodology for executing process primitives, especially those process primitives directly accessed by third-party software, is simply to install the process primitive as a plug-in to that software.

Data primitives refer to a number of specifically formatted file types in the context of their usage by process primitives or other related processes. Data primitives include, but are not necessarily limited to: audio-video files; audio-only files, video-only files; bitmap files; application files; postscript files; graphics files; text files; and synchronization files. Included in synchronization files are a number of time-stamped event file types including, but again not limited to: graphics event files; shareboard event files; window event files; application startup event files; and text event files. The time-stamps in the file signal when to take certain defined actions, thereby enabling the temporal synchronization of the information of one file with respect to another.

A metafile is an abstraction representing a combination of one or more externally stored data primitives which together comprise all externally stored ("out-of-band") information comprising a particular AV or multimedia segment (such as a message). Associated with the metafile is a pointer file, which includes all referencing information for the various component files of the metafile (file names, permission keys, file system, etc.). One or more pointer files and their associated metafiles can be conceptually grouped to form a virtual aggregate file called an omnifile. The omnifile therefore must be in some fashion transferred successfully from one environment to another in order for authored information to be completely replayed in the new environment. This can be done in a number of ways as will be clear to one skilled in the art. One such embodiment is shown at ***Figure*** 27.

In common practice, the term "multimedia file" as been used to refer to an aggregate of all types of media files and external reference file pointers. Multimedia files, like metafiles and indeed like other primitives, are hierarchical: they are combinable into

other files to perform a certain task, for instance as a multimedia file in any of a number of standard formats. Metafiles, as defined herein, are allowed to be distributed across several file systems and do not include pointer files. In contrast, multimedia files can include pointer files and all of their component media files are stored together. Omnifiles do include pointer files but again are a virtual object spanning potentially several vile systems and thus also differ from multimedia files.

An application implementing the principles of the present invention specifically takes some of the file types of interest, and creates a MIME type associated with them. It then enables the teaching of some third party browsers including, but not limited to, Netscape® or Microsoft Internet Explorer®, or some e-mail packages including Eudora® how to handle the MIME types. Accordingly, many of the third-party application types supported by the present invention are taught how to handle the multimedia files, omnifiles, metafiles, audio-video files, and pointer files of the present invention. Therefore, when a third party application receives one of these file types taught by the present invention, it knows how to invoke the proper process primitive.

Referring now to ***Figure*** 28, an exemplar data primitive 3904 is shown which requires a viewer or browser process to display or act upon it. The application has been taught, as described above, how to respond to the receipt of the data primitive, it "knows" when and how to launch process primitives 3912 and 3906. In the viewer/browser exemplar herein presented, receipt of data primitive 3904 by an application causes the application to launch, at 3910 or 3914 either browser 3912 or viewer 3906. Where browser 3912 is launched, it may invoke a plurality, not shown, of viewers 3906. Viewer 3906 invokes, in turn a at least one data primitive 3908 for access to one or more files.

Referring now to ***Figure*** 29, data primitive 3904 is shown embodied as an attachment, for instance a MIME attachment, to a message 3902. By way of illustration but not limitation, message 3902 could be an e-mail message, word processing document, text document, and so forth. Depending on the application, the attachment may be implemented as the previously discussed MIME attachment, or as a file type. When the application is instructed to act upon the attachment, it invokes the process primitive associated with the attachment type, as previously discussed.

It will be understood that the immediately preceding discussion of the viewer/browser process primitive is presented for purposes of illustration and not limitation. The principles of the present invention comprehend an almost limitless number of process primitive configurations, of which the previous exemplar is but one. The teachings of the present invention specifically contemplate all such configurations.

**4.14.1 Viewer**

Video record and playback capabilities can separately be embedded in each application by stand alone means, but preferentially a standardized video record playback utility used across several applications is desirable. Thus a viewer is a good candidate for a process primitive and is explained here as one example of the use of process primitives as taught by the principles of the present invention.

The viewer process primitive sets up the necessary connections and sessions, as previously described, prepares the files for viewing, and provides the necessary viewer interface to enable the user to access and manipulate the files, as permitted. Because the viewer is a standard video call, it can be treated like any other video call. This enables it to be merged with other video calls, conferences, and the like, in similar fashion to any other session enabled by the principles of the present invention.

The implementation of this feature the present invention is disclosed in ***Figure*** 29. Having reference to that figure, the present invention contemplates the utilization of a shell document 3902 invoked for instance by an application in the MCG (not shown). An example of such an application would be the launching of a video mail session, video conference session, or substantially any of the other applications discussed herein. Embedded in shell document 3902 is a MIME attachment 3904. MIME attachment 3904 invokes viewer 3906, which enables the user to access the AVSS through the network as needed to record or playback video files 3908. Permissions to record or playback specific video files may, or to the user accessing the applications. The shared connection, at 3910, presents the novel advantage of enabling video recording or playback and combining it with other applications running concurrently in a separate session. In some applications there is provided a browser, 3912, which enables the user to select between a number of

applications 3906. Alternatively, browser 3912 may be embedded in, or part of viewer 3906.

### 4.14.2 MIME Attachment

Because the viewer is common across all the applications, and because the files it invokes are accessible by the several applications, a first application can use the viewer to record or playback a file, and a second application can utilize the viewer for video mail or substantially any other application. Accordingly, the video files are sharable at the file level, the attachment or MIME level, or at the connection level. The utilization of MIME (Multipurpose Internet Mail Extensions) attachments enables the invocation of the viewer and its associated networking connections within a standardized attachment which is accepted by third parties in accordance with standard MIME protocols. Thus the several applications taught in the present invention are interoperable by means of file sharing by the copying of MIME attachments, or by connection sharing.

### 4.14.3 Synchronized Shareboard

One example of such a concurrent session would be enable the concurrent implementation of share board graphics and a video conference session.

The addition of multimedia synchronization capability to the previously discussed viewer and MIME implementation enables the several video applications previously discussed to include animated graphics files which are synchronized with the video. Share capabilities currently implemented by the principles of the present invention "grabs" a window and stores it as a bitmap file, enabling the user to draw on top of the bitmap file. This enables the document to be used by two or more users which includes overlay graphics, to be stored and synchronized for later synchronous playback.

The synchronization is explained as follows: when the two or more users are conducting a video conference, a first window is opened, and a bitmap superimposed thereon. Any files read into the window or the bitmap may be time stamped. Any animations imposed on the bitmap are draw list events which may also be time stamped. Accordingly the principles of the present invention contemplate the capture of the several times stamps invoked during multimedia recording. This enables the later synchronization, during playback, of the several files to present a synchronous view of the entire session.

Where a video conference includes N users, the recorded version of the synchronized session may be regarded as the N + 1 user. At playback, the recorded version of the session is again treated like any other user.

The recording process previously discussed is substantially the sequential recording of a sequence of events. If it is desirable that the previously recorded events be capable of reversal, it is necessary to render the graphics in such a way that they are reversible. Similarly, where the system enables "go-tos" it is necessary to render the graphics in such a manner that the rendered image is capable of retrieval at specified "go-to" points.

Now we have the capability to grant any screen in the window and share it with any user or any storage device enabled.

Shared applications (not understood). Recording of shared applications is accomplished by a similar means to bitmap capture.

Where annotations that draw overlays are occurring on top of the video window, the workstations must have the capability for performing graphics overlay on top of video.

#### 4.14.4 Browser

The browser aforementioned can also be adapted by those skilled in the art to act as a process primitive in a manner similar to that described thus far.

### 4.15 Applications Overview

The present invention teaches a number of novel software applications enabled by, and for use in conjunction with the video server system, or AVSS, previously discussed. As the present invention enables the implementation of its features in a scalable fashion, the programmatic elements of the present invention provide, among other benefits, the ability to scale the features and advantages presented herein over a wide range of hardware implementations. An overview of one such hardware implementation is shown at ***Figure*** 30.

The present invention provides two broad classes of storage applications. Those which utilize only the basic audio and video recording, storage, browsing, and playback capabilities of the current AVSS will be referred to hereinafter as "video" applications. This is typically a reduced-capability, lower cost implementation. A second class of applications utilize audio and video along with a synchronized data sharing capability, e.g.,

synchronized-shareboard/T.120recording, storage, browsing, and playback features. Such capabilities are essential for recording conferences, messages, or presentations where information cannot be conveniently conveyed by audio and video alone. This class of storage applications will be referred to hereinafter as "multimedia" applications. The additional functionality provided by this class of applications may require a somewhat higher implementation cost.

The principles of the present invention contemplate the AVSS supporting several types of applications. One way in which the several applications can share information is to share certain common "primitive" elements. This has the added advantage of cutting down on the coding required to embody those applications which utilize primitives. Accordingly, one or more of the applications taught by the present invention may utilize shared primitives to facilitate the interchange of information of between applications or applications elements. Alternatively, one or more of these applications may be implemented as a "stand-alone", or "one-off" implementation which does not utilize shared primitives.

### 4.16 Video Applications

As previously mentioned, an AVSS can support several types of applications. By way of illustration, but not limitation, some of these applications include a video mail application which combines, in a novel manner, video clips, or files, with e-mail messages whereby one user can leave a detailed audio-video message on another user's e-mail system. Video mail is like e-mail, but with either a video attachment, or with a video file replacing normal e-mail text altogether. The richness and depth of communication afforded thereby enables significantly greater information interchange than is available by simple voice mail messaging. The Video Answering System taught by the present invention answers a user's e-mail when the user is away or otherwise occupied. This application presents the user with the option of greeting callers in a number of manners, and receiving their video messages in response. One alternative of this application contemplates its implementation using the Video Mail application previously discussed. Video Conference Recording enables a plurality of users to record in real time an

established video conference. This application may be invoked at the user's command or may, alternatively be invoked automatically when certain conference parameters are met.

In addition to these oriented to electronic meetings applications, the architecture of the AVSS system described herein renders, with facility, several additional capabilities. One such capability is the utilization of the present invention as a general-purpose audio-video storage device. This capability enables users to store and forward audio-video files, in a variety of formats, to users throughout the LAN or WAN. The connectivity of such networks to the Internet provides the additional capability of the system as an intranet or Internet gateway for audio, video, audio-video, or multimedia file transfer. Another application is Video Publishing which enables any of a number of system users to create, edit, store and disseminate complex, informationally rich, audio-video documents to a wide variety of recipients by means of LAN, WAN, or to a world-wide audience utilizing the Internet.

### 4.16.1 Video Mail

A first video application enabled by the principles of the present invention is video mail. In a first embodiment of this application a "video attachment" capability is provided to existing MIME-based mail systems. Alternatively, video mail may also be implemented by other attachment strategies, without attachments, or as a fully developed stand-alone application which does not rely on any underlying commercial e-mail package.

In a first embodiment of the present invention, a video attachment utility utilizes the generic video storage and session establishment method hereinafter described. Moreover, this utility utilizes the generic MIME video attachment methodology hereinafter discussed. As opposed to the video mail methodology taught in U.S. Patent No. 5,617,539 which starts a mode control GUI (or "MCG") directly at the user's workstation, an alternative embodiment presented by the present invention sets a "MCG" flag so that the AVSS starts a MCG on the user's workstation. Mail authoring invokes the request for a session with an encoder/decoder pair, while mail reading invokes a request for a session with a decoder only.

The principles of the present invention contemplate the implementation thereof on a wide variety of hardware implementations. In the simplest case, a single AVSS serves

both the message authoring user and the message recipient. In this implementation, there are no file transfers required out of the AVSS. Files may be transferred from the AVSS for other reasons, but there is no functional reason for the files to reside on another AVSS in this case. This could be considered a LAN implementation of the principles of the present invention.

Where a given organization is sufficiently large or so geographically distributed that a single AVSS cannot handle the traffic for all the users thereof, multiple AVSSs may be implemented. This case has two sub-cases: the first sub-case is a WAN implementation, and the second is where the implementation at a given site, for instance a large campus, is so large it requires more than one AVSS. In the second sub-case, the multiple AVSSs are interconnected by trunking 16 between switches 32 and/or the local data LAN 20. Where a file is required on a different AVSS than the recording AVSS in the second sub-case, it is simply transferred over the local interconnection environment 16 and 20. In the first sub-case, require the transfer of relatively large files from one AVSS to another, this implementation may use of switched WAN services, frame relay, or one or more of their functional equivalents. Moreover, because there is may be so much bandwidth required for these transfers, it may be necessary to provide bandwidth management solutions. Examples of such network bandwidth management solutions include, but are specifically not limited to conducting file transfers at non-peak times, conducting file transfers in a preemptible manner, and other bandwidth conservation methodologies known or apparent to those having ordinary skill in the art. When file transfers are conducted in a preemptible manner, if a user initiates a higher priority action, for instance she initiates a video conference, the file transfer may be preempted; i.e. aborted, halted and restarted after the high priority application, etc.

Referring now to ***Figure*** 31, the transaction flow among application elements which facilitate a local or LAN implementation of video mail is shown, where a mail message incorporating a video message is both recorded and read from the same AVSS. Having continued reference to ***Figure*** 31, when the user, at 1404, initiates a new e-mail message, the source e-mail system 1402 queries, at 1406, whether the user intends to attach a video attachment to the e-mail. If the user intends to submit a video attachment with the e-mail

message, a video authoring request is initiated at 1412 to video mail application 1420. Video mail application 1420 creates a unique video file name at 1422 and requests of the recording AVSS 1430, at 1424, an encode session. The audio-video file is then recorded on AVSS 1430. AVSS 1430 returns the video attachment at 1432 to video mail application 1420. Video mail application 1420 in turn sets the file name pointer at 1434 for e-mail program 1402. Once the e-mail message and video attachment have been completed, the user sends the e-mail, for instance using SMTP protocol 1410, by initiating the send procedure at 1408. Once send procedure 1408 is initiated, e-mail program 1402 initiates a notification at 1414 to video mail application 1420 that the message has been sent. Video mail application 1420 then instructs the AVSS 1430 to release the encode session at 1426.

At this point, the e-mail message itself, not shown in this Figure, has been sent to the user in the normal manner, and the recorded A/V file resides in AVSS 1430. When the e-mail program 1402 receives the e-mail message at 1492, it sends, at 1460, a receipt target and information request to video mail application 1420. Responsive to the receipt target and information request 1460, video mail application 1420 extracts a source AVSS address at 1472. Video mail application 1420 then makes a file transfer request 1480 to AVSS 1430.

Responsive to request 1480, AVSS 1430 confirms it already has the requested A/V file, and confirms, at 1448, that the video file transfer is completed. Responsive to file transfer confirmation 1448, video mail application 1420 at 1474 releases the mail message after the A/V file is received. Video mail application 1420 then releases the mail message to e-mail system 1402 at 1462.

At this point, e-mail system 1402 makes the mail available to the user at 1494. Steps 1494 and 1460, in operative combination, ensure that the user is not notified of a message with an associated video attachment before the video attachment arrives. When the user opens the video attachment at 1496, e-mail system 1402 initiates an attachment open event and sets a file pointer at 1464 to video mail application 1420. In response to set file pointer 1464, video mail application 1420 opens a viewer and prepares to decode the AV file at 1476. Video mail application 1420 in turn requests a decode session from

AVSS 1430 at 1482. Decoding of the A/V file by AVSS 1430 renders the file available to the user.

At 1498, once the user closes the message or the video attachment, a view message/attachment and file pointer close event is initiated at 1466. This causes video mail application 1420 to release the view and release the file at 1478. Responsive to release event 1478, video mail application 1420 issues, at 1484, a decode session release command to AVSS 1430. When, at 1493, the user deletes either the message or its video attachment, e-mail system 1402 initiates a message/attachment delete event 1468 to video mail application 1420. Responsive to this event, video mail application 1420 deletes, at 1473, one holder of the file, and at 1486 releases user ownership of the file to AVSS 1430. Alternatively, of course, a video file may be set to expire after a pre-assigned lifetime.

It should be noted that receipt target and information request 1460, release mail message 1462, view message/attachment and file pointer close event 1466, and message/attachment delete event 1468 as taught by this invention are novel concepts and as such are not supported by any known widely available e-mail domain servers. Study of the principles herein disclosed will make obvious to one having ordinary skill in the art that additional dialogs and displays in the video mail application can provide the information supplied by the previously listed messages. Further, a variety of alternate implementations are of course possible and the teachings of the present invention render them clear to those skilled in the art. These alternatives include workarounds for the absence of any or all of 1460, 1462, 1466, and 1468; for example, the unavailability of 1468 could be handled by a file lifetime monitor which takes action to delete a file after a designated period of inactivity.

Referring now to ***Figure*** 32, the transaction flow among application elements which facilitate wide-area video mail is shown, where a mail message incorporating a video message is transmitted from a recording, or source, AVSS 1430 to a target AVSS 1450.

When the user, at 1404, initiates a new email message, the source email system, 1402, queries at 1406 whether the user intends to attach a video attachment to the email. If the user intends to submit a video attachment with the email message, a video authoring request is initiated at 1412 to the video mail application program 1420. Video mail

application program 1420 creates a unique video filename at 1422 and requests of the recording AVSS 1430, at 1424, an encode session. The video attachment is then recorded on the recording AVSS, 1430. AVSS 1430 then returns video attachment 1432 to video mail application 1420. Video mail application program 1420 in turn sets the video filename pointer at 1434 for source email program 1402. Once the email program and video attachment have been completed, the user sends the email, for instance using SMTP protocol 1410, by initiating the send procedure at 1408. Once send procedure 1408 is initiated, source email package 1402 initiates a notification to the video mail application 1420, at 1414, that the email message has been sent. Video mail application 1420 then instructs the recording AVSS 1430 to release the encode session, at 1426.

At this point the email message itself, not shown in this figure, has been sent to a remote AVSS utilizing normal SMTP methodology, while the encoded A/V file resides in recording AVSS 1430. When the email message is received, at 1492, at target email domain 1490 a receipt target and information request 1460 is sent to target video mail application 1470. Responsive to the receipt target and information request 1460 target video mail application 1470 extracts the source AVSS address at 1472. Target video mail application 1470 then sends target AVSS 1450 a file transfer request 1480. This in turn initiates the request 1481, by target AVSS 1450, to recording AVSS 1430 for the A/V file.

The recording AVSS, 1430, transfers the A/V file, at 1436, to the target AVSS 1450. Target AVSS 1450 confirms to the target video mail application 1470, at 1448, that the video file transfer is completed. Responsive to file transfer confirmation 1448, target video mail application, 1470, at 1474 releases the mail message after the A/V file is received. Target video mail application 1470 then releases the mail message to the target email domain 1490 at 1462.

At this point target email domain 1490 makes the mail available to the user at 1494. Steps 1494 and 1460, in operative combination, ensure that the user is not notified of a message with an associated video attachment before the video attachment arrives. When the user opens the video attachment at 1496, target email domain 1490 initiates an attachment open event and sets a file pointer, at 1464, to target video mail application 1470. In response to the set file pointer 1464, target video mail application 1470 opens a

view and prepares to decode the file for the user at 1476. Target video mail application 1470 in turn requests a decode session from the target AVSS 1450 at 1482. Decoding of the A/V file by the target AVSS 1450 renders the file available to the user.

At 1498, once the user closes the message or the video attachment, a view message/attachment and file pointer close event is initiated at 1466. This causes the target video mail application 1470 to release the view and release the file at 1478. Responsive to release event 1478, target video mail application 1470 issues, at 1484, a decode session release command to target AVSS 1450. When, at 1493, the user deletes either the message or its video attachment, target email domain 1490 initiates a message/attachment delete event 1468 to target video mail application 1470. Target video mail application 1470 deletes, at 1473, one holder of the file, and at 1486 releases user ownership of the file to target AVSS 1450. Alternatively of course, video files can expire after a pre-assigned lifetime.

It should be noted that receipt target and information request 1460, release mail message 1462, view message/attachment and file pointer close event 1466, and message/attachment delete event 1468 taught by this invention are novel concepts and as such are not supported by any known widely available e-mail domain servers. Study of the principles herein disclosed will make obvious to one having ordinary skill in the art that additional dialogs and displays in the video mail application can provide the information supplied by the previously listed messages. Further, a variety of alternate implementations are of course possible and the teachings of the present invention renders them clear to those skilled in the art. These alternatives include workarounds for the absence of any or all of 1460, 1462, 1466, and 1468; for example, the unavailability of 1468 could be handled by a file lifetime monitor which takes action to delete a file after a designated period of inactivity.

The exemplar discussed above and illustrated in ***Figure*** 32 demonstrates a wide-area implementation of the present invention utilizing two systems, 1400 and 1440. Shown in the figure is a first methodology whereby two or more instances of a conventional electronic mail system, two or more AVSSs, and two or more instances of a simple video mail software application "middleware" can be used to create a multi-AVSS, WAN-

capable video mail system. This relatively simple network implementation is presented herein for clarity. Study of the principles herein disclosed will make obvious to one having ordinary skill in the art that a number of target systems 1440 may be similarly implemented. All such implementations are specifically contemplated by the principles of the present invention.

The novel concepts of file ownership and video message life cycle are shown in ***Figure***s 33 and 34. In several of the applications taught herein, including video mail, file ownership evolves through the different phases of a message's lifetime. At message authoring, for example, the file is owned by the message author, while at message review the file is owned by the message recipient. This notion of changing file ownership is presented in ***Figure*** 34, which more clearly points out both ownership and readability of the video files associated with a video mail attachment over the message lifetime. Not shown in the figure are the effects of messaging forwarding, but this is simply a second authorship/recipientship transaction exactly like that shown in the figure.

Having reference now to ***Figure*** 33, the life cycle of an exemplar video message file is discussed as follows:

When a video file is created, at 1510, associated with a message by means of a reference pointer 1512, then transmitted, a mailing list 1514 is obtained from the conventional email system, 1513, and presented to the recording AVSS at 1516. Recording AVSS 1516 determines the recipients' addresses from mailing list 1514, which are then associated with the name of their serving AVSS by means of directory services. The directory services provide a mechanism whereby names, e-mail address or login identities of users may be looked up and associated with their video address in a LAN or WAN environment. The AVNM server in the present embodiment could provide such directory services, or these services may be provided by well known directory protocols such as LDAP.

At 1518 the programmatic elements of the present invention make a determination as to whether or not the mailing list 1514 associated with the video mail message is empty. If, at 1520, it is determined that the mailing list is not empty, a further determination is made for each recipient in the list if the current recipient of the message is served by the

recording AVSS at 1522. If, at 1524 the determination is made that the current recipient is served by the recording AVSS the file is retained on the AVSS and the next recipient is chosen from the mailing list at 1526. Responsive to the selection of the next recipient at 1530, step 1518 is again invoked until the mailing list is empty. Responsive to a determination of 1528 that the current recipient is not on the recording AVSS the file is transferred to a target AVSS 1580. The completion of the copy at 1529 returns to step 1526 to select the next recipient from the mailing list. Responsive to the selection of the next recipient, at 1530, step 1518 is again invoked until the mailing list is empty.

It is a principal feature of the present invention that the relatively large video files associated with multimedia and video communications be distributed where required and maintained thereat, but only for so long as required. In this manner the principles of the present invention present a heretofore unattained level of systems economy with respect to mass storage, bandwidth, and other system delimiters. Accordingly, the principles of the present invention specifically contemplate the automated deletion of video files once certain deletion criteria have transpired. Examples of these criteria include, but are specifically not limited to: the reading of a giving file by all of its intended recipients, the passage of a certain period of time, a certain number of invocations of the message, and other message accounting parameters well known to those having ordinary skill in the art. Having this deletion criteria in mind, a determination is made at 1582 if one or more deletion criteria has been met. In the event that the deletion criteria has not been met the system loops back, at 1586, and returns to wait for the deletion criteria to be met at 1582. Responsive to a determination, at 1584, that the deletion criteria has been met at 1588 the file is deleted from the target AVSS at 1588.

Returning now to the loop through the mailing list at step 1518, if, at 1540 a determination is made that the mailing list is empty a query is made a 1542 as to whether any file recipients are served by the recording AVSS. Responsive to a determination at 1540 that no file recipients are served by the recording AVSS, the file is deleted from the recording AVSS at 1550 and this function of the present invention is completed at 1552. Responsive to a determination by step 1542 at 1544 that file recipients are served by the recording AVSS, a determination is made at 1545 at to whether file deletion criteria has

been met. If a determination is made at 1546 that the file deletion criteria has not been met the system loops back and returns to wait for the deletion criteria to be met at 1545. Responsive to a determination by step 1545 at 1560 that the file deletion criteria has been met the file is deleted from the recording AVSS at step 1550 which action completes this function of the present invention at 1552.

From the foregoing, several novel aspects of the present invention are made manifest.

Within each AVSS, copies of the file can be distributed to one or more additional disks with the same AVSC or multiple AVSCs so as to diminish blocking to file access. This improves both system responsiveness and system reliability. In smaller implementations of the present invention, this file distribution utilizes full replication of the video files. In larger implementations, a "hashing" mapping is utilized, and is explained as follows: where a file may be in high usage, rather than leaving it on only one AVSS, for instance the AVSS on which the file was authored, thereby leaving it only on the one disk which may result in unwanted delays in access time, the principles of the present invention contemplate the distribution of high usage files to one or more storage devices within an AVSC, or indeed to a number of different AVSCs within the system. This may be accomplished by means of any of a number of hashing schemes known to those having ordinary skill in the art. This of course improves the availability of the file, and thus the reliability of the system which relies on the file.

The life cycle advantages presented by an exemplar embodiment of the present invention include, but are not necessarily limited to, the following:

(A) Video files are maintained only on those AVSSs serving a specified recipient for the video file, unless stored at another location for purposes of reliability and data redundancy.

(B) Video files are deleted automatically once all messages which include the video file have been deleted; and

(C) Where a recipient is located on an AVSS other than the recording AVSS, the video file is automatically transferred to the target AVSS. The transfer function may be implemented as "copy" or "reliable move".

These advantages ensure that relatively large video files are transferred only where needed, and retained only on those AVSSs which require them, and then only for as long as the files are required. Unneeded files are automatically deleted from any AVSS when no longer required by any recipient served by that AVSS.

Referring now to ***Figure*** 34, during the recording and review processes, 1602 and 1604, a given file is both readable and owned by its author. Once the author sends the file, at 1606, it is still owned by the author but is unreadable. This condition continues through SMPT and video file transfer 1608 and the receive phase, 1610. Once the recipient is notified, at 1612, of the arrival of the email message and video file, both file readability and file ownership pass to the recipient. This condition continues through the message read and delete phases, 1614 and 1616 respectively. Of course, once the file is deleted it is neither owned nor readable.

The author could select to be a recipient or simply remain an owner. The file would therefore remain readable by the author during the send 1606, transfer 1608, received 1610 and notified 1612 steps. The author would participate in the read 1614 and delete 1616 phases.

Certain AVSS capabilities are required depending on the conference client implemented at individual desktops or rooms. When the previously discussed video mail system is implemented inside an enterprise incorporating desktops or rooms outfitted with workstation conference clients as described in U.S. Patent No. 5,617,539, the following AVSS features are assumed:

1. Generic control protocol interface/API.

2. A generic multi-platform audio-video recording/playback utility (similar to vfstool) referred to herein as the "mode control GUI" or "MCG".

3. Multi-session recording/playback capability.

4. Analog A/V I/O.

5. An AVSC decoder is co-allocated when an encoder is allocated. This ensures that the decoder is always available during the record session for review.

6. Variable capacity scaling to match the needs of supported applications.

7. File transfer capability (pull model) among AVSSs driven by specific file transfer requests made by applications.

8. Effective "loopback" at the AVSC of incoming video to outgoing video during record mode.

9. A video editing capability. This capability may be internally implemented as part of an applications program, or in the alternative, may be capable of invoking third party video and/or audio editors.

Where desktops or rooms are not outfitted with the workstation conference clients taught in U.S. Patent No. 5,617,539, but rather are fitted with standard MPEG or other encoder/decoders, the following additional capabilities are required:

10. The capability to accept and playback appropriate digital files from third parties as controlled by applications.

11. The capability to transfer appropriate digital files to third parties as controlled by applications.

Sending video email naturally implies the creation of a video file. The principles of the present invention contemplate numerous video file creation scenarios. Video files may be pre-recorded, edited, and stored using the AVSS as a video file storage repository. They may be created at the same time the user is sending the video email. Video files may be imported from other video sources as described elsewhere herein, and attached to video mail messages. Finally, a video mail attachment may completely obviate the need for text with the message. In this latter embodiment of the present invention, the video attachment becomes the message, to the exclusion of text. Accordingly, it will be appreciated that substantially any methodology used to create a video file may be implemented to create video attachments for video mail, and are all comprehended by the teachings of the present invention.

When a user wishes to send a new audio-video attachment to a video mail message, this is accomplished by creating a new audio-video file by selecting FILE: NEW from the viewer main menu and then recording the video. Video recording may comprehend, in one or more embodiments, several levels of editing capability. The most rudimentary of these enables a user to delete a file and then re-record it. Only slightly

more sophisticated is an embodiment which enables a user to first review his recording, and then delete it if needed

A further improvement is an editing scheme which enables the user to insert/delete/import material into a file. Finally, the video file is saved as an audio-video file on the local file system. The present invention contemplates each of these editing strategies in each of the applications taught herein.

While the present invention contemplates the incorporation therein of the above-described editing features, it also contemplates the utilization of a third-party video editor for any and all video editing. The third-party editor may be invoked from the present invention by means of primitive, plug-in, invocation button, scripts, or other invocation methodologies well known to those having ordinary skill in the art.

Where desired, the user then uses her normal email package to create an e-mail text message. She then attaches the AV file pointers to the email and then transmits or sends the email. An alternative embodiment contemplates a more closely integrated mail package which includes an Attach Video menu item in the mail package compose dialogue. To slightly simplify the previously discussed process, the Attach Video menu item would launch the viewer with the -n switch to indicate the viewer should automatically create a new video file and open an encode session.

When a user receives an email with an audio-video attachment, he opens the attachment using his email reader. This launches the viewer to open the audio-video attachment. If the video is password protected, the user is prompted the supply the password. If the password is incorrect, the file is not opened. Alternatively, the viewer will in turn, if necessary launch the conference mode of operation. In the case where the file is stored on the AVSS to which the viewer is connected, when conference successfully connects to the AVSS, the VCR controls for playback are enabled on the viewer. Utilizing the play, seek, and rewind buttons of those controls the user plays the video and sees and hears the output at the workstation.

In the case where the file is not stored locally, the AVSS will initiate a file transfer to receive the MPEG video from the remote AVSS. The user is notified that the transfer is taking place. When the file transfer is complete, VCR type controls for playback will

be enabled on the viewer. Alternatively, the user could choose to connect to the remote AVSS in a manner similar to connecting to the local AVSS.

The preceding discussion has centered on a first embodiment of the present invention. Alternative embodiments contemplated by the teachings herein disclosed include: the attachment of A/V files by means of pointing to file locations as opposed to direct use of MIME systems; invocation of one or more of the previously discussed processes at the opening or closing of an attachment, or the opening or closing of a message; A/V network and server socket management schemes; video viewer and location and close management methodologies; and screen cleanup and connection management methodologies.

### 4.16.2 Video Answering System

The video answering application utilizes the AVSS to record an audio and video message from an incoming caller whose call attempt is either not answered or is refused by the recipient. The present invention also contemplates the incoming caller simply wishing to leave a message without connecting to the recipient. One implementation of this feature of the present invention supports the case were no A/V codec trunks are available at that the time when a call is placed to a user. The video answering system includes several major components: an answering module; a browser module; a playback module; and a module wherein file transfers are potentially handled among AVSSs.

The principles of the present invention contemplate several methodologies whereby the video answering application is invoked. One way of invoking video answering is to provide an option to a caller at any time during the "ring" cycle to leave a message for recipient. Additionally, a caller may be presented the option for leaving the message in any of the following cases: after a specified duration of a ring cycle, i.e., a ringing time-out; when a call is refused; and when the caller receives a busy signal due to an excessive number of waiting calls.

When this application is invoked, the caller may be given the option of leaving a message in a number of ways. Such notification methodologies include, but are specifically not limited to: simple text notification; simple audio tone; an audio-only greeting; a video-only greeting; an audio-video greeting, and a multimedia greeting. The

decision to implement any of these notification methodologies depends on several factors including available storage capacity, bandwidth, desired system response parameters, desired system "look and feel," as well as other system constraints well known to those having ordinary skill in the art.

Several implementations contemplated for WAN installations include alternatives for placement of the user greetings, which alternatives include user greetings located on the user's AVSS, or alternatively be distributed to each AVSS on the WAN to be stored locally thereat. These alternatives depend on many systems installation factors including the number of users, system usage, bandwidth, and so forth. With respect to message authoring, the message may be recorded locally and sent to a remote site as in video mail, previously discussed. Alternatively the system may be configured such that it establishes a direct link to the receiving AVSS and the message is recorded on the received side. This later implementation results in more assuredly prompt delivery of the message, but requires more immediate bandwidth.

The caller may explicitly choose to not to leave a message by means of either a specific response to a dialog box, or simply by activating the hang-up button on the call viewer.

One implementation of this feature the present invention provides a caller with the opportunity to leave a message automatically either as part of an existing call status, e.g.: a user busy pop-up, with the automatic playing of a pre-recorded video greeting, or other automatic message system invocation methodologies. Once the user accepts the option to leave the message, a record session request is passed to the AVSS. When the request is granted, an MCG is provided, and an AVNM connection is established. In the event that the recipient attempts to answer the call when the caller is recording the message, a non-destructive escape is provided which enables the caller to complete the message and then connect the call to the called party. A similar non-destructive escape is utilized when the called party attempts to call back when the message recording is a process. The principles of the present invention further contemplate a destructive escape if the caller wishes to abandon the message during the recording session. Finally, in the event that the AVSS has insufficient resources to grant the record request, a fall back mode presents the caller

with the option to leave a non-video message. Such a non-video message is provided by the "Leave Word" function of the incorporated reference.

In one embodiment of the present invention, recipients are notified when there are messages present in their respective queues. Since there could be more than one message in queue at any given time, the video answering system provides a browser to enable the recipient to review the messages waiting in her queue. The browser can display information about the video messages, including, but not limited to: caller's name, time and date of call, video file name, playback duration, description, text note from caller, and creation time of video. Finally, a playback mode is provided to enable the recipient to play the messages selected for viewing.

File ownership in the video answering application is as follows: When a message is being authored, the file is owned by the message's author. When the message is being reviewed, file ownership passes to the recipient, as identified by the AVNM.

Referring now to ***Figure*** 35, an overview of one embodiment of the video answering system of the present invention is discussed. When a caller, for instance at workstation 1802, calls a recipient, for instance the user at workstation 1804, and the video answering system is invoked as previously discussed, a request is sent from workstation 1802 to AVNM 1702. AVNM 1702 then forwards a request at 1710 to video answer module 1704, which in turn submits a session request to AVSS 1708 at 1714. Responsive to session request 1714, AVSS 1708 provides a reply, 1716, to the video answer module.

Responsive to reply 1716, the video answer module 1704 establishes, at 1712, a connection control with AVNM 1702 and notifies video playback module 1706 of the establishment of a video answering session at 1718. Responsive to this notification, video playback module 1706 submits its own session request to AVSS 1708 at 1720. Responsive to this session request, AVSS 1708, at 1722, establishes a second connection control with AVNM 1702 at 1722.

A data flow diagram detailing the operation of one embodiment of the present invention is given at ***Figure*** 36. Having reference to that figure, a caller initiates a video call request at 3502. When the video call request is not accepted at 3504, the recipient's

greeting is invoked at 3506. As previously discussed, the video call request may not be accepted for a number of reasons, including but specifically not limited to: the caller exercising her option at any time during the "ring" cycle to leave a message for the recipient; after a specified duration of a ring cycle, i.e., after a ringing time-out; when a call is refused; and when the caller receives a busy signal due to an excessive number of waiting calls.

If the video call is not accepted, the recipient's greeting is played at 3506 and the caller is presented, at 3508, with the option of leaving a message for the recipient. This option may again be presented in a number of manners, by way of example but not limitation including: a simple text notification; a simple audio tone; an audio-only greeting; a video-only greeting; an audio-video greeting; and a multimedia greeting. If the user, at 3510, exercises her option not to leave a video message, the video answering session terminates at 3512. In the alternative, if the user exercises her option, at 3514, to leave a video message, she may create the message at 3516 in any of the manners previously discussed for the creation of video messages.

Responsive to the creation, by the caller, of the video message at step 3516, at 3518 the message is sent to the appropriate AVSS. At some later point in time, the message is delivered to the recipient at 3520. Subsequent to the recipient invoking a browser, reader, or other file inspection methodology for the purpose of reading the message, not shown in this view, the user is presented with the option, at 3522, of deleting the message.

In the event the recipient elects, at 3524, to delete the message, it is deleted from the AVSS at 3526. In the alternative, where the recipient elects, at 3528, not to delete the message, it retained on the AVSS at 3530.

The principles of the present invention contemplate two broad strategies for implementing the video answering system taught herein. A first broad strategy implements a "layered" methodology, integrating a number of applications, some of which may be pre-existing, into the video answering system of the present invention. One such layered implementation contemplates the use of the previously discussed video mail application as a message handling vehicle. This embodiment inherently defines many of

the major file ownership issues. Further, the previously discussed authoring, browsing, playback, and notification functions are all provided by the video mail application itself. Another version of a layered implementation contemplates the utilization of a dedicated instance of a conventional email system program to provide dedicated video answering system message notification and browsing.

A second broad strategy contemplates the creation of a unique "stand-alone" application to perform the previously defined functions. This strategy, which does not utilize video mail or other program as a message handler, requires the implementation of user interfaces to present the caller with the option of leaving a message. Moreover, such an implementation requires non-mail software and new user interfaces to accomplish the tasks of message notification, message browsing, and message playback.

#### 4.16.2.1 Layered Implementation of Video Answering System

This implementation contemplates the use of the previously discussed video mail application, or other discrete application as a message handler or other system element for the video answering system. According to this strategy, after a video connection has been established responsive to a video call not being accepted, video mail can be authored on either the transmit side, i.e., the caller's AVSS, or on the receive side, i.e., the recipient's AVSS. Which implementation constitutes the embodiment is an economical decision, based on a number of system-specific factors.

Video mail created responsive to the video answering system can be transmitted to the recipient off-line, i.e. in a non-real-time mode. This implementation would likely have minimal impact on system bandwidth in most embodiments. One option for this implementation is to author on the send side, and utilize a priority queue to transmit the message during a period of low bandwidth utilization to the recipient's AVSS. This moves the message out of real time and transmits it at a lower bit rate than authoring on the receive side, which would necessitate full-bandwidth connectivity. The alternative to this latter embodiment is of course to author video mail messages responsive to video answering system invocation on the receive side or transmit the message at the same baud rate as in video conferencing. Either embodiment is a systems administrator issue:

conservation of bandwidth against a degree of time delay in the message responses. Where messages are needed almost immediately, the expense of bandwidth may be necessitated.

Where the video message system is invoked responsive to the fact that no communications trunks are available between sites, it may still be desirable to leave a message in any event, for later transmission when communications become available. This functionality may be enabled by a script provided by the system administrator or other automated invocation methodology known to those having ordinary skill in the art.

Where the enterprise is not too large, all greetings files from all users could be stored at all sites. Greetings files from all users at all sites enables a rich environment for video answering, where, even when there are no communications trunks available, a caller is greeted with an audio-visual greeting from any recipient. Again, this is an issue of capability versus storage capacity. Accordingly, the system administrator can determine where greetings are stored in accordance with the principles of the present invention.

Where an enterprise generally experiences low communications volumes, messages can be recorded on the receive side to good effect. This embodiment minimizes time delays in getting mail messages to the recipients. Even in this embodiment, where trunks become unavailable, or encounter periods of high use, the message can be recorded on the callers side under control of a script, and then sent as a mail message when bandwidth is available.

Other modifications to this embodiment include giving the caller the option, on the GUI, of prioritizing her message. When sending a file, e.g. an MPEG file, use of video mail enables a caller to transmit the file as a response to an answering machine response.

There are video mail systems that are entirely separate from video conferencing systems. For example, when a caller is recording a video mail message, she may be recording it in MPEG-1 video format. When a caller is talking to a recipient in real time, she may be sending video in, for example, H.320 format. The principles of the present invention contemplate the implementation of video answering by invoking video mail in such a way that it doesn't use H.320. Alternatively, where H.320 is recorded, the principles of the present invention specifically contemplate the use of this same "live"

format for both recorded and real time video applications. This implementation further contemplates the utilization of bandwidth management techniques, recording schemes, and video compression algorithms to minimize the bandwidth impact of the relative large video messages engendered by the use of H.320 format video, as well as some other video formats.

The use of video mail as the message handler for the video answering application presents an additional complication in that it can be recording on the caller's side or on the recipient's side. The latter option ties the application more closely to the act of calling the recipient, thereby ensuring prompt delivery. In one embodiment of the present invention, a call-back feature is implemented, which automatically initiates a call back to the sender to talk to them in real time, or a reply-back feature, to which automatically invokes video mail to enable the recipient of a video message to reply with a video message of her own.

Where video mail is utilized, an attachment, for instance a MIME attachment constructed as herein after discussed, may be included in a caller's message to the recipient, the activation of which enables the recipient to return the call of the original caller. Such a MIME attachment could initiate a dialog box or button which, when activated, launches a reply call and/or message response. This provides a replacement for the "Leave Word" function taught in U.S. Patent No. 5,617,539. Alternatively, the principles of the present invention contemplate having the "Leave Word" function implemented, using it to notify the recipient of the receipt of a message, and where it can be found, e.g., the recipient's mail queue. Alternatively, the "Leave Word' function could enable querying the message from the mail queue, or it could have an entirely separate account only for video mail.

#### 4.16.2.2 Stand-alone implementation of Video Answering System

In contrast to the previously discussed layered implementation of this application, an alternative embodiment of the present invention is characterized by being a stand-alone implementation of the video answering system of the present invention. This embodiment does not utilize any other programs, such as video mail, to provide the requisite message handling or other features of the video answering system. Many of the previously

discussed engineering choices pertain to this embodiment, including but not limited to greetings used; location of stored greetings; how the greetings are transmitted; and whether messages are recorded remotely or locally. Because this embodiment does not utilize the functionality of other programs, these system engineering choices are not dependent on the message handling system of such an application to implement the answering machine function.

Additionally, the GUI can be better tailored to its function as an answering machine when a stand-alone version is implemented. The stand-alone strategy obviates the need for the recipient to go to the mail system to check her mail file, or any other file specified for answering machine messages. This points out an inconvenience in those versions of video answering which implement video mail as a message handler: these implementations act more like mail systems and less like an answering machines. The stand-alone version has an increased potential for being more responsive to the user with fewer intermediate steps for the user to perform in order to access, review, and process her video answering system messages. A video mail-based system is set up as a stand-alone messaging environment, while an answering machine could be more easily tuned to the fact that the recipient had been called and been left a message. This makes the answering machine function much easier to use, and, in most implementations, has at least one less layer than mail system-based implementations. Moreover, the use of video mail-based systems may present limitations on greetings, file, and recording locations, etc.

Another consideration is that, in some organizations, mail and answering machine functions may have very different urgencies. Accordingly, a call message may have a corporate priority above video mail messages. Where this is the case, answering system messages should be easier to get to, easier to review, and easier to respond to than mail messages in these organizations. In contrast, mail messages are more like memos: they are generally more thoughtfully produced documents. Moreover, mail messages not only have mail browsers associated therewith, but they typically also have one or more text fields. Accordingly, use of video mail as a message handler would likely present the recipient with one or more blank text fields when an answering machine message is displayed.

As the use of a stand-alone answering system removes the extra layers inherent in the previously discussed video mail-based application, the recipient can see a listing of those persons who had called, like in the Leave Word function of the incorporated reference. This presents the user with the option of simply replying to the message by returning the call or by clicking on the entry to see what had been left in the answering machine messages: video; audio; or a combination thereof. In any case, response can be by message or by call. Accordingly, this embodiment contemplates the inclusion, in the message transmitted responsive to the video answering machine, of a broad array of video, audio, text, and multimedia attachments therein.

### 4.16.3 Video Conference Recording

The Video Conference Recording application allows users to record the audio-video portion of audio-video conferences.

In conference recording for a call or conference of *N* participants, there are potentially *N+1* possible viewpoints to record from: the conference as viewed by each individual and the conference as viewed as a sort of composite "global view", which comprehends the combined views, audio, video and multimedia, of all the conference participants. The most comprehensive form of a "global view" would be provided by recording each participant's video and audio separately in multiple concurrent record sessions, for later combination and playback.

Although this extremely comprehensive embodiment would enable a reviewer to freely look back at each participant in full detail at any time, this approach is very resource and disk-space intensive, as it requires a separate record for each participant. While the principles of the present invention specifically contemplate such an embodiment, for all but the most massively implemented hardware suites it will be appreciated that combining the several participants' views into a single global view file is generally preferred, as it is far less resource intensive. Accordingly, it will be appreciated that there is a strong overhead cost basis for recording only one "global view" video and audio signal.

Referring now to ***Figure*** 37, an overview of the video conference recording application of the present invention is discussed. When the user, for instance 1802,

desires to invoke the video conference recording feature taught herein, a request is sent to the AVNM 1810. AVNM 1810 then forwards a request at 1812 to video conference recording application 1830 to initiate a conference recording session. Video conference recording application 1830 then submits a session request, 1814, to AVSS 1816. AVSS 1816 establishes connection control at 1818 with AVNM 1810. Video conference recording application 1830 also allocates a conference bridge at 1820 to AVNM 1810.

A user invokes, at 1806, a browser 1821 which in turn invokes a video playback application 1822. Invocation of video playback application 1822 initiates a session request at 1824 to AVSS 1816. Responsive to the session request, AVSS 1816 establishes connection control at 1820 with AVNM 1810.

Referring now to ***Figure*** 38, an overview of several of the components of the present invention required to implement video conference recording is discussed. Having reference to that figure, a first workstation 1802 can comprise any of a number of the previously discussed workstation implementations including camera 2302, microphone 2304, monitor/video card 2306, and speaker 2308. These components may optionally be connected by means of cabling, or other connection means known to those having ordinary skill in the art, to additional hardware element add-on box 2310 which in turn is connected with MLAN switch 2206. While the present invention contemplates the incorporation of a number of workstations to MLAN switch 2206, only a second workstation, 1804, is shown in this figure for purposes of illustrational clarity. Those having ordinary skill may art will recognize that a number of workstations may be so connected.

MLAN switch 2206 is connected with AVNM 1810, not shown in this view, at 2332. A conference bridge 2208 and AVSS 1816 are severally connected to MLAN switch 2206. Conference bridge 2208 further comprises a transceiver set 2336 in operative combination with MLAN switch 2206. Connected to transceiver set 2336 are video switch 2340 and audio mixer 2342. Further connected to video switch 2340 is a video mosaic generator 2346.

AVSS 1816 includes a further transceiver 2352, an encoder 2354, and a decoder 2356. A storage device, 2408, is coupled with encoder 2354 and decoder 2356.

When a point to point, or two-party, video conference is established, point-to-point connectivity is established between workstations 1802 and 1804 through MLAN switch 2206, as shown in ***Figure*** 39. A video signal 2902 is transmitted from camera 2302 of workstation 1802 to monitor 2320 of workstation 1804. Moreover, an audio signal 2904 is transmitted from microphone 2304 to speaker 2322 of workstation 1804. Similarly, camera 2316 of workstation 1804 transmits its video signal 2906 to monitor 2306 of workstation 1802, while microphone 2318 transmits its audio signal 2908 to speaker 2308. Having continued reference to that figure, the simple implementation of a conference between two users does not invoke either conference bridge 2208 or AVSS 1816.

The inclusion of a third party, or the implementation of the video conference recording request, invokes a conference bridge 2208 as shown in ***Figure*** 40. While this figure may be used to illustrate the principles of a multi-party conference call, only two workstations are illustrated herein for purposes of clarity. Having continued reference to the figure, the invocation of conference bridge 2208 is shown. In this case audio signals 3002 and 3004 are transmitted by means of MLAN switch 2206 through transceiver 2336 to audio mixer 2342, and thence to their respective recipients. In similar fashion video signals 2508 and 2502 are transmitted through MLAN switch 2206 through transceiver set 2336 and video switch 2340 to video mosaic generator 2346. Mosaic generator 2346 transmits a signal including a mosaic video, 2510, showing all users to video switch 2340. Video switch 2340 then splits this video signal into signals 2506 and 2506'.

When a user initiates a video conference recording request, the signal processing is substantially similar to that shown in ***Figure*** 40, with the additions illustrated in ***Figure*** 41. Having reference to the latter figure, a third video signal 3104, again comprising video mosaic 2510, is split at video switch 2340 and transmitted through MLAN switch 2206 to AVSS 1816. Similarly the audio signals 3002 and 3004 are combined by the audio mixer 2342 producing a summed audio signal 3102. Summed audio signal 3102 is transmitted through MLAN switch 2206 to AVSS 1816. The video mosaic 2510 and summed audio signal are received at

transceiver 2352, encoded at encoder 2354, and stored on storage device 2408. A subsequent request from a user for information stored on storage device 2408 is transmitted by means of decoder 2356 through MLAN switch 2206 and thence to the requesting users workstation.

The present invention contemplates that a user may select between any of a number of video representations made available by mosaic generator 2346. By way of illustration, but not limitation, three such alternatives are shown in ***Figures*** 42, 43, and 44. The previously discussed scenario is shown at ***Figure*** 42 wherein user 1, user 2, and the AVSS all see a mosaic of both users. Referring now to ***Figure*** 43, the view presented to each user, at their selection, is that of a close-up of the other user. Despite this selection, the AVSS continues to receive a mosaic of all users. Referring now to ***Figure*** 44, user 1 in this view sees a mosaic of himself and user 2, and user 2 sees a close-up of user 1. As before, the AVSS continues to receive a mosaic of all users being recorded.

The logic required to implement the previously discussed video conference recording application is presented in the data flow diagram of ***Figure*** 45. This logic may be implemented as software, hardware, firmware, or any combination of the foregoing. Having reference to that figure, a video conference recording request is initiated at 3402. The principles of the present invention specifically contemplate a number of methodologies for initiating this request. One such methodology has been previously discussed, wherein a given user initiates a request for video conference recording. Such a request makes usable the recorded video conference to any user having permission thereto. An alternative to this embodiment contemplates the situation wherein, for legal or record purposes, it is desired that *all* video conferences be recorded. In this alternative, the administrator having administrative responsibility for the system taught and disclosed herein may mandate, at her option, that video conference recording be implemented for all video conferences conducted, or for certain specified video conferences, for instance between a specified set of users.

Once the video conference recording request 3402 is initiated, video conference recording application 1830, not shown in this view, is initiated at 3404. When a

conference bridge was not previously allocated, such a conference bridge is now allocated at 3406. The initiation of the conference recording application initiates an AVSS session request at 3408 which in turn establishes connection control with AVNM 1810 at 3410. This in turn enables AVNM connectivity with the users at 3412.

Conference bridge allocation 3406 enables the establishment of a network A/V connection from a MLAN switch 2206, not shown in this figure, at 3414. Video signals are transmitted to video switch 2340 at 3416, which in turn transmits the signals to mosaic generator 2346 at 3420. Mosaic generator 2346 in turn transmits the mosaic video back to video switch 2342, at 3416, from whence the mosaic video 2510 is transmitted to the user's and AVSS 1816 at 3418.

Referring again to step 3414, audio signals are transmitted to audio mixer 2342 at 3422. Audio mixer 2342 sends the summed audio signals at 3426 to AVSS 1816. As shown at step 3424, audio mixer 2342 further transmits to each user a copy of the summed audio signal, less that user's own audio signal.

At this point mosaic video and summed audio are stored on storage device 2408 at step 3430. When a user, having permissions, desires to access recorded video conference information, he may do so by means of browser 1821 invoked by MCG, not shown in this view, or other user interface at 3450. Browser 1821 then accesses video playback application 1822 at 3452. Step 3452 in turn initiates another AVSS session request at 3408, enabling multiple concurrent recording and playback sessions by authorized users.

Referring now to ***Figure*** 46, the playback of recorded Video conference calls is explained. A previously recorded conference call is stored on storage device 2408 of AVSS 1816. When playback of the conference call is invoked, it is transmitted at 4170 through decoder 2356, which separates the recorded conference call into its composite video and audio signal components, 4180 and 4182 respectively. In the exemplar presented in ***Figure*** 46, only two conference participants, at workstations 1802 and 1804, are shown for purposes of illustrational clarity. Of course the principles of this embodiment of the present invention contemplate a larger plurality of user workstations.

Video signal 4180 is transmitted through MLAN switch 2206 to transceiver 2336,

and thence through video switch 2340 to mosaic generator 2346. Note that mosaic generator has inputs for each $N$ conference participant plus one for video signal 4180. In this manner, previously recorded video conferences are treated as additional conference participants during playback. The output from mosaic generator 2346 is a mosaic 4190 having $N+1$ frames: one for each participant, plus one for the recorded conference being played back. The output from mosaic generator 2346 is transmitted to video switch 2340, where it is split into two video signals, 4188 and 4188' and transmitted to workstations 1802 and 1804 as shown.

A corresponding audio signal 4182 is simultaneously transmitted through MLAN switch 2206 and transceiver set 2336 to audio mixer 2342. Audio mixer 2342 sums the audio inputs, 3004 and 3002, from users at workstations 1802 and 1804 respectively with audio signal 4182 in the following manner: a first summed audio signal, 4184, is transmitted to a first user at workstation 1802, and is composed of the sum of audio signals from a second user at workstation 1804 and from the recorded video signal 4182. A second summed signal 4186 is transmitted to a second user at workstation 1804, and is composed of the sum of audio signals from the first user at workstation 1802 and from the recorded video signal 4182. In this embodiment, note that in each case the workstation's own signal is not transmitted back to that workstation for purposes of improving audio clarity, but that the summed signal contains only audio from other "participants", which includes the signal from the recorded conference. The system may also maintain a summed audio signal for all participants.

From the foregoing, the following features and advantages of a first embodiment the present invention are shown:

1. The "global view" of the sum of all user's audio signals is used by the Video Conference application so as to capture all parts of the conversation.

2. For multi-point conferences, the "global view" for both audio and video is readily obtained from the conference bridge hardware in the following manner:

A. Global view video is naturally produced by the video mosaic box.

B. Global view audio is provided by a special mix in the audio matrix mixer. This "global" mix is exactly the one used in ganging distributed

conference bridges. In other words, the "global" mix is the audio signal recorded. A subset of the global mix is sent to each of the conference users. This subset includes the global mix less the user's own audio signal. This is necessary in order to preclude "echoing" and other adverse audio effects.

Each user is provided with a choice between global view video and a selected close-up view. This feature is enabled by the standard MCG.

3. For point-to-point calls (i.e., a two-user conference), a signal capturing global view is generally not inherently available from within the hardware layer and is synthetically created as described.

In multi-party conferences, a conference bridge is automatically allocated. Where a single global viewpoint is to be recorded, two-user calls mandate that a conference bridge be allocated by the video conference application. This conference bridge is most efficiently used if it comes from the same pool used for real-time multi-party conferences.

In the case of protracted conference recordings it may be desirable to "tag" points in time where certain discussion events occurred. One embodiment of the present invention contemplates the use of such tags. Tags are preferably given a unique identifier, for instance a searchable text label or letter, whereby a specific discussion event is uniquely identified.

A user interface is provided to invoke and name a conference recording, and to invoke and operate the tag interface, where implemented. Additional user interfaces are implemented on the MCG for message notification; message browsing; and invocation of message playback.

It should be further noted that the conference bridge is not sensitive as to the nature of the input source. Accordingly, by way of illustration but not limitation, input can be by means of security camera, VCR, or substantially any other video or audio source, and so forth. Moreover, a conference call can specifically include a previously recorded video file All these inputs can be recorded as they are discussed. From this, and as previously discussed, it follows that the system enables multiple simultaneous source sessions: e.g.: one or more recording sessions and one or more playback sessions, and

they are all completely independent. Each is connected to the conference bridge, and the user interfaces are available to one or more users during the video meeting.

The Video Conference Recording application previously discussed utilizes and implements the following capabilities:

1. Generic control protocol interface/API.

2. A generic multi-platform audio-video recording/playback utility referred to herein as the "mode control GUI" or "MCG".

3. Multi-session recording/playback capability.

4. Analog audio-video input and output.

5. A decoder co-allocated when an encoder is allocated. This ensures that the decoder is always available during the record session for review.

6. Variable capacity scaling to match the needs of supported applications, and hardware configurations.

Moreover, the following capabilities may be required or advantageous, depending on how wide-area calls are handled, or where architecturally convenient.

7. File transfer capability (pull model) among AVSSs driven by specific file transfer requests made by applications.

8. Effective "loopback" at the AVSC of incoming video to outgoing video during record mode.

9. A video editing capabilities. This capability may be internally implemented as part of an applications program, or in the alternative, may be capable of invoking third party video and/or audio editors.

### 4.16.4 Video Documents

The Video Documents application allows stored video files to be included in an on-line electronic document such as Word ™ or Framemaker ™. This can be used for many enterprise-wide applications including, but not necessarily limited to: training, corporate memory, procedures, references, marketing, and so forth. There are also many potential overlaps with the Intranet and Internet, as discussed below.

One embodiment of this feature of the present invention is shown in ***Figure*** 19. Having reference to that figure, substantially any archival video are combinable with text

or documents. Moreover, the principles of the present invention comprehend video overlay graphics, which overlay the video, as well as a compendium of a plurality of video files which further include additional text or graphics, standalone videos, and MIME attached video files. Accordingly, the video document may bring up a video window alongside the document as viewed by the user, or overlaying the document, which enables the user to play the video while viewing the document. Video can come from any previously discussed source. Videos in a video document are sharable during a conference call or by video mail or messaging.

An embodiment of the present invention contemplates attaching the viewer to a message as a MIME or other functional attachment. A given call may be expanded to include other participants and other mechanisms to merge the document into a running conference. In other words, by the establishment of another concurrent session. This is more than simple video as it enables synchronized graphics either overlaying the video or accompanying the video.

Of course, any such implementation which necessitates the interface with third-party software raises some interoperability issues. Some of these issues include:

The necessity, in some implementations, to make available an additional document type for the supported package using MIME extensions.

The workstation Conference client video window and the MCG may be used for video delivery. However, in some applications of the principles of the present invention, it may make more aesthetic sense to include the video window and some associated controls, e.g., the playback control, in the document itself. One means of implementing this feature would be as a graphics type within an anchored frame.

The necessity, in some implementations, to capture both "video type" delete events and "entire document" delete events so as to not fill the file system with unused video files.

The necessity, again, in some implementations, for an automatic file transfer or user-warning mechanism to ensure that video files are transferred when the document is transferred to a domain not served by the authoring AVSS.

Each of these issues is, of course, highly application specific. The implementation of specific solutions thereto is within the purview of those having ordinary skill in the art, in light of the teachings herein enumerated.

The system can support video document applications either using conventional third-party document systems or document systems enhanced to offer the ability to obtain and or file copy events from the document system.

The present invention can use word processing GUIs and the MCG. Accordingly, additional user interfaces are not required.

The Video Documents application requires the following capabilities:

1. Generic control protocol interface/API.

2. A generic multi-platform audio-video recording/playback utility (similar to vfstool) referred to herein as the "mode control GUI" or "MCG".

3. Multi-session recording/playback capability.

4. Analog A/V I/O.

5. An AVSC decoder is co-allocated when an encoder is allocated. This ensures that the decoder is always available during the record session for review.

6. Variable capacity scaling to match the needs of supported applications.

7. File transfer capability (pull model) among AVSSs driven by specific file transfer requests made by applications.

8. Effective "loopback" at the AVSC of incoming video to outgoing video during record

Additionally, the following feature is required to include other video file sources:

9. The capability to accept and playback appropriate digital files from third parties as controlled by applications.

Finally, in a first embodiment of the present invention, in order to support Internet access, the following feature is required:

10. The capability to transfer appropriate digital files to third parties as controlled by applications.

12. A video editing capabilities. This capability may be internally implemented as part of an applications program, or in the alternative, may be capable of invoking third party video and/or audio editors.

### 4.16.5 General Purpose Video Storage

In many cases there are needs for less sophisticated "raw" video storage capabilities reachable from workstations over the video distribution network. These "raw" needs amount to the functionality of a network-accessible VCR or writable laserdisk with its information organized according to file system conventions. Sources for the stored video content may be, for example, clips from broadcast news programs, copies of camcorder footage, captured segments from videotapes, video files transferred from the CDs, DVD, or the Internet. Although user workstations are likely involved with the acquisition, capture, or transfer of such video information (via auxiliary audio/video input jacks at the desktop workstation, file transfer actions, etc.), in general the genesis of this class of video is in contrast video captured from video calls, video conferences, message authoring, or video document authoring. Further, the storage of this class of "raw" video information would not support supplementing the video with any annotations, text, shared graphics, etc.

Current trends in computing lead users to treat such "raw" video clips as any other file in their networked computing environment, freely copying individual copies of large video files and storing them on local disk or in standard data-network file servers. Such an approach has several disadvantages:

- such video only available at workstations with decoding capabilities for the needed video protocol and file format
- data networks and standard data file systems get heavily loaded given even a modest amount of video usage
- large numbers of private copies of large video files load local disks and file servers even further by huge multiples.

It is obvious to one skilled in the art that the current invention easily addresses these shortcomings by offering:

- centralized shared encoding, decoding, and transcoding

- moving video over appropriate video-engineered networks rather than data networks
- sharing of a small number (one to a few) of these large-size files across the entire community of users who need access to the file
- still permitting file-transfer and digital streaming where required or desired.

To do this, the video file formats used must match those supported by the AVSS.

By appropriately designing the invention's handling of this class of video information, the video information can be freely exchanged with other types of applications. For example, subject to file permissions, video information can be exchanged between "raw" video clips of the general purpose video storage application and other AVSS applications:

- a "raw" video clip can be incorporated into a videomail message, video document, video publishing applications, video web pages, etc.
- a "raw" video clip can be viewed within a video call or conference
- any video captured within a recorded video call, recorded video conference, video message, or other networked video applications could be captured as a "raw" video clip.

In some situations such exchange of video information between applications would involve an entire unaltered video file. The actual methods for the exchange for this case can be accomplished in at least one of two ways:

- creating a new application-owner of the existing file
- playing back the file as rendered video which is then re-recorded, possibly during viewing, by another networked video application

Other methods are also possible for one skilled in the art.

In other situations, only segments of an original video file are to be transferred between applications, or other edits of the original video file may be required. For these cases, the actual methods for the exchange could include at least one of the two following ways:

- use of a video file editor on the existing file to create a new (edited) file, and assigning the appropriate application-owner to this new file
- playing back the file as rendered video and, during viewing, re-record selected segments by means of another networked video application.

Other methods are also possible for one skilled in the art.

The General Purpose Video Storage application requires, in most implementations, the following capabilities:

1. Generic control protocol interface/API.

2. A generic multi-platform audio-video recording/playback utility (similar to vfstool) referred to herein as the "mode control GUI" or "MCG".

3. Multi-session recording/playback capability.

4. Analog A/V I/O.

5. An AVSC decoder is co-allocated when an encoder is allocated. This ensures that the decoder is always available during the record session for review.

6. Variable capacity scaling to match the needs of supported applications.

7. File transfer capability (pull model) among AVSSs driven by specific file transfer requests made by applications.

8. Effective "loopback" at the AVSC of incoming video to outgoing video during record

9. The capability to accept and playback appropriate digital files from third parties as controlled by applications.

10. The capability to transfer appropriate digital files to third parties as controlled by applications.

12. A video editing capabilities. This capability may be internally implemented as part of an applications program, or in the alternative, may be capable of invoking third party video and/or audio editors.

In some limited domain cases, only features 1-8 may be required.

### 4.16.6 Intranet Video Storage Utility

Intranet refers to the use of Internet utilities, such as web pages, web browsers and web sites, as a means for distributing enterprise-internal information. In that web page

authoring tools commonly accept MIME attachments, clearly the AVSS video MIME attachment service primitive can be used in a web page within an enterprise outfitted with the invention. As shown in ***Figures*** 3 and 4, the AVSS can readily be connected with the Internet to facilitate the use of its capabilities with web pages and other Internet utilities.

Use of the AVSS video MIME attachment allows not only the attachment of video clips to arbitrary intranet web pages but also any other features that could be included in the MIME attachments, such as synchronized shareboard sessions, discussed later). Further, as any AVSS video file or AVSS MIME attachment can, subject to permissions, be transferred easily from AVSS-application to AVSS-application, the intranet can serve as another useful enterprise-internal video publishing method.

It should be noted that other types of AVSS-based video applications could be written to serve as web page building blocks by those skilled in the art. Thus, the AVSS advantages described above can be obtained by those skilled in the art via means other than the AVSS MIME attachment.

The Intranet Video Storage application enables raw audio-video files as well as video documents be stored, searched, and accessed within the enterprise, in accordance with Intranet browser interfaces and other conventions.

The General Purpose Video Storage application requires, in most implementations thereof, the following capabilities:

1. Generic control protocol interface/API.

2. A generic multi-platform audio-video recording/playback utility (similar to vfstool) referred to herein as the "mode control GUI" or "MCG".

3. Multi-session recording/playback capability.

4. Analog A/V I/O.

5. An AVSC decoder is co-allocated when an encoder is allocated. This ensures that the decoder is always available during the record session for review.

6. Variable capacity scaling to match the needs of supported applications.

7. File transfer capability (pull model) among AVSSs driven by specific file transfer requests made by applications.

8. Effective "loopback" at the AVSC of incoming video to outgoing video during record

9. The capability to accept and playback appropriate digital files from third parties as controlled by applications.

12. A video editing capabilities. This capability may be internally implemented as part of an applications program, or in the alternative, may be capable of invoking third party video and/or audio editors.

In some limited domain cases, only features 1-8 may be required.

### 4.16.7 Internet Gateway

Current trends in desktop computing technology, networking, and Internet usage has just started the emergence of video files and streaming over the Internet. These few early video exchanges are essentially all low resolution and usually low frame-rate, hence the resulting impact on limited Internet bandwidth, limited corporate network bandwidth, and limited enterprise file system space has been noticeable but manageable. As video rapidly increases in importance to business, limited Internet bandwidth, limited corporate network bandwidth, and limited enterprise file system space will be immediately taxed. Also to be noted is that increasing business use of video will demand increasing resolution and frame-rate, ballooning the bandwidth and file size requirement for each second of video information. Finally, current trends continue to encourage a plethora of video standards and protocols; to support all of them and their respective evolutions at each desktop workstation demands costly computing power, applications software, dedicated hardware, and administration; in many enterprises, this is completely intractable.

As shown in ***Figures*** 3 and 4, the AVSS can readily be connected with the Internet. With this connectivity, the AVSS can be used as a gateway for incoming Internet video streams (which it can read into and thus convert into a file) as well as a proxy-server for incoming video file transfers from the Internet. Once these resulting video files are in the AVSS, perhaps initially captured as "raw" video (as described earlier), they then can be viewed at user workstations or used in other AVSS applications. The AVSS can provide any transcoding operations that may be needed. This approach permits, at no appreciable additional cost, an enterprise outfitted with the invention to pull

in large amounts of video information from the Internet, store it economically, and make it available to any user with a workstation fitted with the invention's low-cost audio-video networking hardware and software.

The AVSS can also be used as a repository for video files accessed outside the enterprise via the Internet. The simplest implementation of this nature would simply make "raw" video files available on the network. This could be extended to include annotation animations, generated for example by shareboard or a similar data-sharing application; such annotation animations could in fact be available stand-alone or temporally synchronized to audio, video, or audio-video material. Software viewers and players (with software-only video decoding, for example) could be created as application software for use with, or incorporation into, Internet browsers. The software viewers and players can be implemented and deployed in various ways in a manner readily understood by those skilled in the art, for example:

- an applet downloaded from the server over the Internet
- a full application downloaded from the server over the Internet, said application such that it can be installed on the Internet-user's personal computer
- a stand-alone application product bought and sold in the marketplace

It is noted that all of the above functionality could further be extended in scope to include the capability of handling the full AVSS MIME attachments.

The Internet Gateway application implements at least one of the following functions: the reception of incoming audio-video information from the internet; and the making of internal audio-video information digitally accessible to third parties on the Internet.

Implementation of a first embodiment of this part of the present invention requires the following AVSS features:

8. Effective "loopback" at the AVSC of incoming video to outgoing video during record

9. The capability to accept and playback appropriate digital files from third parties as controlled by applications.

12. A video editing capabilities. This capability may be internally implemented as part of an applications program, or in the alternative, may be capable of invoking third party video and/or audio editors.

Where a remote user is outside the enterprise, the principles of the present contemplate the utilization of third-party browsers including, but specifically not limited to Netscape, Microsoft Internet Explorer, and/or FTP.

Embodiments of the Internet Gateway application would typically require the following capabilities:

1. Generic control protocol interface/API.

2. A generic multi-platform audio-video recording/playback utility (similar to vfstool) referred to herein as the "mode control GUI" or "MCG".

3. Multi-session recording/playback capability.

4. Analog A/V I/O.

5. An AVSC decoder is co-allocated when an encoder is allocated. This ensures that the decoder is always available during the record session for review.

6. Variable capacity scaling to match the needs of supported applications.

7. File transfer capability (pull model) among AVSSs driven by specific file transfer requests made by applications.

8. Effective "loopback" at the AVSC of incoming video to outgoing video during record

Additionally, at least one, and in some implementations both, of the following capabilities are required by some embodiments:

9. The capability to accept and playback appropriate digital files from third parties as controlled by applications.

10. The capability to transfer appropriate digital files to third parties as controlled by applications.

12. A video editing capabilities. This capability may be internally implemented as part of an applications program, or in the alternative, may be capable of invoking third party video and/or audio editors.

### 4.16.8 Video Publishing

Video publishing is accomplished by a user posting video on the AVSS for viewing within the desktop collaboration system or throughout the standard data-based Internet/Intranet.

Desktops (analog or digital) can access stored video documents, either over the LAN, the WAN, or the Internet. They can also be made available to CMW users, as well as outside workstations which have reduced graphics capability. Video publishing enables the publishing of the documents to the outside world, as well as the importing, from the outside world, of additional material, again including text, graphics, audio, video or multimedia files. This latter feature comprehends the import and export of a number of disparate video and other formats including, but specifically not limited to, MPEG1 – 7, Motion JPEG, Video for Windows, Quicktime, DVI, recorded H.320, wavelets, and wavelet-compressed fractals.

The implementation of video publishing on the AVSS comprehends a transcoding methodology embodied as hardware, software or firmware to enable the transcoding among the several formats required, thereby making the video files substantially format transparent to the receiver thereof. Any user with a workstation and permissions from the system administrator can accordingly publish documents to any user on the net or any other person outside the net who has access to the files. This enables high quality video publishing from analog equipment without the expense of implementing digital equipment.

At some point, it becomes cost-prohibitive to maintain all the video files ever created by an enterprise on rapid online storage, such as magnetic or magneto-optical hard drives. At some point long term or mass storage must be implemented for outdated or seldom-accessed video files. The present invention contemplates the inclusion therein of an automated routine which determines the relative time importance of files and either moves them to and from one or more types of long term storage device, including mass storage, magnetic tape, or other long term storage technology well known to those having ordinary skill in the art, or which deletes the files from the system. This algorithm either presents the user with the option of archiving her video files, or does so automatically. This may be done by user script from the System Administrator, or other archival storage

technology well known to those having ordinary skill in the art.

### 4.17 Multimedia Applications

The present invention enables the establishment of real time data sharing sessions between two workstations using shareboard or other synchronized data sharing technologies. The implementation of shareboard enables a given application to be invokable on each workstation involved in the video conference, video mail or other application taught herein. Any user having permission to access the file may then import onto his screen, as another window, a copy of the application onto that screen. Independent scrolling of each screen is enabled. On top of this application in the window the users may then independently point, draw, type text, and perform other graphics functions by means of graphics overlay files. The user can further grab other file programs and so forth and draw them into the conference window. Further, the users may independently telepoint the items on one or more of these applications. Each of these shareboard features are further explained in the incorporated reference.

The present invention enables the shareboard features previously discussed to be extended to the use of stored applications. This enables a user to simultaneously narrated and telepoint, for instance point into the subject of interest and using language like "this one here and that one over there". Accordingly, it will be appreciated that what is required is minimally the user's voice being synchronized with the actions of the pointer. The present invention not only enables this feature in real time, but further enables that this synchronized speech and graphics capability is storable and retrievable such that when the stored file is invoked the data, speech, and graphics synchronization remains accurate. This enables the file to be recorded, stored, and sent to another user as video mail, as an input in response to an answering system greeting, as a document, or substantially in any other file format taught or made obvious by the teachings of the present inventions. It should be noted that this storage includes underline bitmaps of any application so invoked.

The shareboard reference, fully discussed in the incorporated reference, is used in a first embodiment of the present invention. This provides for a uniform user interface. As shareboard is an intricate feature of the video conference methodologies taught herein, the extension of its features to the other applications taught herein enables like

functionality without the implementation of additional recording tools or user interfaces. In a very real sense the utilization of shareboard not only means that a user must learn only one interface, usable in real time or otherwise, but it also helps with the users ideation that he is enabled, by the principles of the present invention, to share data across the several applications forming the application suite herein. The combination of multimedia synchronization, previously discussed, combined with shareboard functionality solves a number of compatibility, data reuse, and user interface problems. Moreover, the user shareboard in operative combination with the multimedia synchronization previously discussed enables the implementation of the principles of the present invention utilizing very specific data storage formats as well as the sharing of bitmaps.

A slightly more general case in the use of shareboard is application sharing. When an application is invoked and a plurality of conference users can simultaneously utilize it, for instance each entering data in a single shared spreadsheet program. The present invention is no longer operating with only a snapshot of a bitmap image, but rather is actually working in the process of the application and the several users are simultaneously changing files together.

### 4.17.1 Multimedia Mail

The Multimedia Mail application adds synchronized datashare, e.g., synchronized-Shareboard/T.120 recording, storage, browsing, and playback capabilities to the Video Mail application described in the previous section.

This inclusion of this feature provides significant value in that mail messages can now include the same media options as real-time desktop video conferencing. Thus a user can telepoint to one number in a spreadsheet, and then circle another number in the spreadsheet, as she first smiles and then says "How on earth could this number be half of this number?" and the entire cross-media message gets captured and conveyed as it would have been in a live desktop video conference, including all the subtle communications included by gesture, tone of voice, body language, and so forth.

The full content of other multimedia storage applications with synchronized datashare, e.g., synchronized-Shareboard T.120 recording and playback capabilities. Thus a user can forward a multimedia answering application message, multimedia

conference recording, and so forth with other authors or authoring venues in multimedia mail or other multimedia application taught herein. This application requires a new AVSS feature:

11. Synchronized datashare, e.g., synchronized-shareboard/T.120 recording, storage, browsing, and playback. This event list information is best stored in a separate file from the MPEG A/V file; the pair of this event list and the MPEG A/V file could be called a "multi-media meta-file."

### 4.17.2 Multimedia Answering System

The Multimedia Answering application adds synchronized datashare, e.g., synchronized-Shareboard/T.120 recording, storage, browsing, and playback capabilities to the Video Answering application described in the previous section.

Utilization of this feature provides significant value in that a user can leave a more complete message in comparatively very little time should the call recipient themselves or the necessary connectivity not be available at the time a call attempt is made. This is because all relevant graphic overlay can be included in either the recipient's greeting or the caller's message.

Again, this application, like all other multimedia applications discussed herein utilizes the previously discussed feature 11.

### 4.17.3 Multimedia Conference Recording

The Multimedia Conference Recording application adds synchronized datashare, e.g., synchronized-Shareboard/T.120 recording, storage, browsing, and playback capabilities feature 11 to the Video Conference Recording application described in the previous section. This ensures that all transactions spanning the full spectrum of media used in desktop teleconferences of two or more participants can be captured for later review.

### 4.17.4 Multimedia Documents

The Multimedia Documents application adds synchronized datashare, e.g., synchronized-Shareboard/T.120 recording, storage, browsing, and playback capabilities of feature 11 to the video documents application described in the previous section. This ensures that procedural descriptions leveraging video can also include synchronized

telepointing and annotation. This is extraordinarily valuable in on-line training and reference material applications.

### 4.17.5 General Purpose Multimedia Storage

The General Purpose Multimedia Storage application adds synchronized datashare, e.g., synchronized-Shareboard/T.120 recording, storage, browsing, and playback capabilities feature 11 to the General Purpose Video Storage application described in the previous section. The advantages presented by such an implementation mirror those discussed above in the section entitled "Multimedia Documents".

### 4.17.6 Intranet Multimedia Storage Utility

The Intranet Multimedia Storage application adds synchronized datashare, e.g., synchronized-Shareboard/T.120 recording, storage, browsing, and playback capabilities of feature 11 to the Intranet Video Storage application described in the previous section. Again, the advantages presented thereby are similar to those discussed above in the section entitled "Multimedia Documents".

The principles of the present invention have been discussed herein with reference to certain embodiments thereof. Study of the principles disclosed herein will render obvious to those having ordinary skill in the art certain modifications thereto. The principles of the present invention specifically contemplate all such modifications. The present invention may be practiced without any element disclosed herein.

## CLAIMS

1. A networked multimedia system comprising:

A) a plurality of workstations, each including

i) video and audio reproduction capabilities, and

ii) video and audio capture capabilities;

B) at least one converter configured to

i) convert audio/video signals,

(a) originating at any one of the workstations,

(b) into a form suitable for storage;

C) at least one storage cell configured to

i) store,

(a) the converted audio/video signals

- for later retrieval; and

D) at least one signal path,

i) interconnecting

(a) the workstations, the converter(s) and the storage cell(s),

wherein system is configured to

i) store converted signals,

(a) onto the storage cell,

(b) such that the stored converted signals

- can later be retrieved

i. under direction of one or more of the workstations.

2. A networked multimedia system comprising:

A) a plurality of workstations, each including

i) video and audio reproduction capabilities, and

**(a)** video and audio capture capabilities;

**B)** at least one converter configured to

**i)** convert audio/video signals,

**(a)** originating at any one of the workstations,

**ii)** into a form suitable for storage;

**C)** at least one storage cell including

**i)** at least one storage cell,

**ii)** each storage cell being configured to

**(a)** store,

- for later retrieval,
- signals

**i.** converted by at least one of the converters, and

**(b)** facilitate transfer

- of previously stored audio/video signals
- to another storage cell
- whether included in that or another storage cell system; and

**D)** at least one signal path,

**i)** interconnecting

**(a)** the workstations, the converters and the storage cells,

wherein the system is configured

**ii)** to co-operate with the storage cell

**iii)** to manage

- the storage and
- transfer,

i. of the converted audio/video signals,

ii. among storage cells.

3. A networked multimedia system comprising:

A) a plurality of workstations, each including

i) video and audio reproduction capabilities, and

ii) video and audio capture capabilities;

B) at least one storage server

i) the storage server including

(a) at least one storage cell having

- at least one storage disk,
- a storage disk controller
  - i. associated with each disk, and
- at least one converter; and

(b) a storage cell manager (AVSM), and

ii) configured to

(a) store,

- for later retrieval,
- audio/video signals
- converted by the converter(s); and

C) at least one signal path,

i) interconnecting,

(a) the workstations and the storage server,

wherein the networked multimedia system is configured to

ii) store the converted audio/video signals by

**(a)** selecting any one of the group consisting of disks, disk controllers, converters, storage cells and storage cell managers (AVSM), according to the following approach:

- if a first converter
  - **i.** of a first cell
  - **ii.** has reached its capacity or bandwidth limit,
  - **iii.** then a second converter, of the first cell, is selected;
- if a first disk controller
  - **i.** of the first cell
  - **ii.** has reached its capacity or bandwidth limit
  - **iii.** then a second disk controller of the first cell is selected;
- if a first disk,
  - **i.** associated with a first of the disk controllers
  - **ii.** has reached its capacity or bandwidth limit,
  - **iii.** then a second disk associated with the first disk controller is selected;
- if the first storage cell
  - **i.** associated with a first storage cell manager (AVSM)
  - **ii.** has reached its capacity or bandwidth limit,
  - **iii.** then a second storage cell associated with the first storage cell manager (AVSM) is selected; and
- if the first storage cell manager (AVSM) has reached its capacity,
  - **i.** then a second storage server, is selected, and

**(b)** storing the converted signals using each of the selected ones of the group.

4. A networked multimedia system comprising:

A) a plurality of workstations, each including

i) video and audio reproduction capabilities, and

ii) video and audio capture capabilities;

B) at least one converter arranged to

i) convert audio and/or video information,

(a) originating at a workstation,

(b) into a form suitable for storage;

C) a least one storage cell, each including

i) at least one storage disk

(a) configured to receive and store,

- for later retrieval,
- the converted audio/video signals,

D) at least one storage cell manager (AVSM); and

E) at least one signal path,

i) interconnecting

(a) the workstations, the converter and the storage cells,

wherein the system is configured to perform any one of the group of functions consisting of:

ii) transferring

(a) the stored converted signals

(b) between any two storage disks of any storage cell;

iii) transferring

(a) the stored converted signals

(b) between any two storage cells,

- under control of a single storage cell manager (AVSM); and

iv) transferring

(a) the stored converted signals

(b) between any two storage cells

- respectively under control of different cell managers (AVSM).

**5.** The networked multimedia system of any one of claims 1, 3, or 4 wherein

A) the system is configured to

i) facilitate transfer

(a) of converted audio/video signals

(b) previously stored by a first storage cell

(c) to another storage cell

**6.** The networked multimedia system of any one of claims 1 to 4, wherein

A) the converter is at least one of

i) a transcoder, an encoder and a combination encoder/transcoder.

**7.** The networked multimedia system of any one of claims 1 to 4, wherein

A) retrieved signals can

i) result in audio/video reproduction

ii) at one or more of the workstations.

**8.** The networked multimedia system of any one of claims 1 to 4, wherein

A) the converted signals are stored

i) in at least one file, which can be accessed by

(a) more than one workstation at the same time and/or

(b) more than one application type.

**9.** The networked multimedia system of claims 8, wherein

**A)** multiple copies of each such file can exist.

**10.** The networked multimedia system of claim 9 further comprising:

**A)** a storage server defined by at least the following

**i)** at least one of the storage cells,

**ii)** at least one of the converters and

**iii)** at least one controller configured to do at least one of the group of

**(a)** determine whether signal conversion is to occur;

**(b)** if the system comprises more than one converter,

- determine which of a plurality of converters will accomplish the conversion;

**(c)** if the system comprises more than one storage cell,

- determine which of the storage cells will store the converted signals;

**(d)** control the subsequent retrieval of the stored signals; and

**(e)** determine which copy of the file is accessed for retrieval.

**11.** The networked multimedia system of claim 10, wherein

**A)** the storage server

**i)** is physically distributed or decentralized across the system.

**12.** The networked multimedia system according to claim 8, wherein the system is further configured to

**A)** generate a sequence of graphics rendering events

**i)** associated with computer generated images and/or overlay graphics at a workstation, and

**B)** save the generated sequence.

**13.** The networked multimedia system according to claim 12, wherein

**A)** the generated sequence of graphics rendering events

i) can be played back to render computer generated images and/or overlay graphics

(a) at a workstation,

(b) together with a workstation-user related audio and video

(c) in a determinable temporal relationship, and

B) the system can

i) save the event sequence

(a) related to the displayed computer generated and/or overlay graphics images and/or the audio and video

ii) such that the event sequence can later be reproduced

(a) at a workstation

(b) in the determined temporal relationship.

**14.** The networked multimedia system according to claim 13, wherein

A) the at least one file includes

i) the saved sequence of graphics rendering events.

**15.** The networked multimedia system according to claim 6, further comprising:

A) at least one decoder, configured to

i) decode signals retrieved from storage.

**16.** The networked multimedia system of claims 8, wherein

A) the file is a metafile including

i) at least one of the group of an audio-video file, audio only file, video only file, a graphics event file, a window event file, an application startup event file, a bit map file, a postscript file, a graphics file, a synchronization file and a text file.

**17.** The networked multimedia system of claim 16, wherein the metafile further includes

i) at least one pointer referencing

(a) a predetermined file or group of files

- on one or more of the storage cells

18. A method of using a networked multimedia system comprising the steps of:

A) capturing audio and video at

i) one or more workstations, each including

(a) video and audio reproduction capabilities, and

(b) video and audio capture capabilities;

B) converting the captured audio/video signals,

(a) into a form suitable for storage;

C) storing,

(a) the converted audio/video signals

(b) within a storage cell,

(c) such that the stored converted signals

- can later be retrieved

i. under direction of one or more of the workstations.

19. A method of using a networked multimedia system comprising the steps of:

A) capturing audio and video at

i) one or more workstations, each including

(a) video and audio reproduction capabilities, and

(b) video and audio capture capabilities;

B) converting captured audio/video signals,

i) into a form suitable for storage

ii) by using at least one converter;

C) storing

i) for later retrieval,

(a) signals

(b) converted by at least one of the converters,

ii) onto at least one storage cell;

D) transferring

i) previously stored audio/video signals

(a) to another storage cell

- whether included in that or another storage cell;

E) managing

i) the storage and

ii) transfer,

(a) of the audio/video converted signals,

(b) among storage cells.

**20.** A method of using a networked multimedia system comprising:

A) capturing audio and video at

i) one or more workstations, each including

(a) video and audio reproduction capabilities, and

(b) video and audio capture capabilities;

B) converting the captured audio and video

i) into a form suitable for storage;

C) storing

i) for later retrieval,

ii) the converted audio/video signals

iii) by using

(a) at least one storage cell having

- at least one storage disk,

- a storage disk controller
  - i. associated with each disk, and
- at least one converter; and

**(b)** a storage cell manager (AVSM); and

**D)** storing the converted audio/video signals,

**i)** by selecting any one of the group consisting of disks, disk controllers, converters, storage cells and storage cell managers (AVSM), according to the following approach:

**(a)** if a first converter
- of a first cell
- has reached its capacity or bandwidth limit,
- then a second converter, of the first cell, is selected;

**(b)** if a first disk controller
- of the first cell
- has reached its capacity or bandwidth limit
- then a second disk controller of the first cell is selected;

**(c)** if a first disk,
- associated with a first of the disk controllers
- has reached its capacity or bandwidth limit,
- then a second disk associated with the first disk controller is selected;

**(d)** if the first storage cell
- associated with a first storage cell manager (AVSM)
- has reached its capacity or bandwidth limit,

- then a second storage cell associated with the first storage cell manager (AVSM) is selected; and

**(e)** if the first storage cell manager (AVSM) has reached its capacity,

- then a second storage server, is selected, and

**ii)** storing the converted signals using each of the selected ones of the group.

**21.** A method of using a networked multimedia system comprising the steps of:

**A)** capturing audio and video at

**i)** one or more workstations, each including

**(a)** video and audio reproduction capabilities, and

**(b)** video and audio capture capabilities;

**B)** converting captured audio and/or video,

**i)** into a form suitable for storage;

**C)** providing a least one storage cell, each including

**i)** at least one storage disk

**(a)** configured to receive and store,

- for later retrieval,
- the converted audio/video signals,

**D)** providing at least one storage cell manager (AVSM); and

**E)** performing any one of the group of transferring functions consisting of:

**i)** transferring

**(a)** the stored converted signals

**(b)** between any two storage disks of any storage cell;

**ii)** transferring

**(a)** the stored converted signals

**(b)** between any two storage cells,

- under control of a single storage cell manager (AVSM); and

**iii)** transferring

**(a)** the stored converted signals

**(b)** between any two storage cells

- respectively under control of different storage cell managers (AVSM).

**22.** The method of any one of claims 19, 21 or 22 further comprising the step of:

**A)** transferring

**i)** the stored audio/video signals

**ii)** to another storage cell.

**23.** The method of any one of claims 19 to 22, further comprising the step of:

**A)** reproducing

**i)** audio and/or video

**ii)** at one or more of the workstations

**iii)** based on the retrieved signals.

**24.** The method of any one of claims 19 to 22, wherein

**A)** converted signals are stored

**i)** in at least one file, which can be accessed by

**(a)** more than one workstation at the same time and/or

**(b)** more than one application type.

**25.** The method of claim 24, wherein

**A)** multiple copies of each such file can exist.

**26.** The method of claim 24, further comprising the steps of:

**A)** generating a sequence of graphics rendering events

**i)** associated with computer generated images and/or overlay graphics at a workstation, and

**B)** saving the generated sequence.

**27.** The method of claim 26, wherein

**A)** the generated sequence of graphics rendering events

**i)** can be played back to render computer generated images and/or overlay graphics

**(a)** at a workstation,

**(b)** together with a workstation user related audio and video

**(c)** in a determinable temporal relationship

the method comprising the step of:

**ii)** saving the event sequence

**(a)** related to the displayed computer generated and/or overlay graphics images and/or the audio and video

**(b)** such that the event sequence can later be reproduced

- at a workstation
- in the determined temporal relationship.

**28.** The method of claim 27, wherein

**A)** the at least one file includes

**i)** the saved sequence of graphics rendering events.

**29.** The method of claim 25, further comprising the step of:

**A)** decoding signals retrieved from storage.

**30.** A networked multimedia system comprising:

**A)** a plurality of workstations, each including

**i)** video and audio reproduction capabilities, and

**ii)** video and audio capture capabilities;

**B)** at least one signal converter configured to

**i)** convert audio and/or video information

**(a)** originating at a workstation,

**(b)** into a form suitable for storage

**C)** at least one storage cell configured to

**i)** store,

**(a)** audio and video information

- captured at a workstation

**(b)** as at least one file,

- for later retrieval;

**D)** at least one signal path,

**i)** interconnecting

**(a)** the workstations, the converter(s) and the storage cell(s); and

**E)** at least one pointer referencing

**i)** a predetermined file or group of files,

**(a)** on one or more of the storage cells,

**ii)** wherein the system is configured to transmit,

**(a)** at least the pointer

**(b)** to a receiving application program

**iii)** render the contents

**(a)** of the file or group of files

**(b)** at a workstation

(c) by retrieving data

- from the file or group of files

31. The networked multimedia system of claim 30, wherein

A) the pointer file

i) has at least one function selected from the group consisting of

(a) identifying a data file,

(b) identifying at least one storage cell on which the data file is stored,

(c) identifying a media type of the data file,

(d) providing access authorization to the data file,

(e) providing a natural-language title of the data file,

(f) providing a natural-language description of the data file,

(g) identifying a creator of the data file, and

(h) noting a time of creation of the data file.

32. A networked multimedia system comprising:

A) a plurality of workstations, each including

i) video and audio reproduction capabilities, and

ii) video and audio capture capabilities;

B) at least one signal converter configured to

i) convert audio and/or video information

(a) originating at a workstation,

(b) into a form suitable for storage

C) at least one storage cell configured to

i) store,

(a) audio and video information

- captured at a workstation

**(b)** as at least one file,

- for later retrieval;

**D)** at least one signal path,

**i)** interconnecting the workstations, the converter(s) and the storage cell(s);

**E)** a viewer configured to enable a workstation user to do at least one of

**i)** setting up connections and sessions;

**ii)** preparing files for viewing, and

**iii)** providing a viewer interface for the user to access and manipulate files.

**33.** The system of claim 32, wherein

**A)** the viewer is

**i)** invoked as a standard video call, and

**ii)** is capable of being merged with at least one of

**(a)** video calls, video conferences, video messages, multimedia calls, multimedia conferences, and multimedia messages.

**34.** The system of claim 33, wherein

**A)** the viewer is implemented as a process primitive.

**35.** The system of claim 33 wherein

**A)** the viewer includes a plurality of viewers,

the system further comprising

**B)** a browser for selecting at least one of the plurality of viewers.

**36.** A networked multimedia system comprising:

**A)** a plurality of workstations, each including

**i)** video and audio reproduction capabilities, and

**ii)** video and audio capture capabilities;

**B)** at least one signal converter configured to

**i)** convert audio and/or video information

**(a)** originating at a workstation,

**(b)** into a form suitable for storage

**C)** at least one storage cell configured to

**i)** store,

**(a)** converted audio and video information

- captured at a workstation

**(b)** as at least one file,

- for later retrieval;

**D)** at least one signal path,

**i)** interconnecting

**(a)** the workstations, the converter and the storage cell(s);

**E)** at least one stored-video application program

**i)** on at least one of

**(a)** the storage cell

**(b)** a workstation; and

**F)** at least one process primitive

**i)** that can be shared

**ii)** across at least two of

**(a)** the stored-video application programs.

**37.** The networked multimedia system of claim 36, wherein

**A)** at least one of the stored-video application programs

**i)** is one from the group consisting of:

(a) videoconference recording; video mail; video answering system; video documents; and video publishing.

**38.** The networked multimedia system of claim 37, wherein

**A)** the process primitive

**i)** is one from the group consisting of:

**(a)** viewer; browser; MIME attachment; an annotation authoring tool; and video editor.

**39.** The networked multimedia system of claim 38, wherein

**A)** the system is further configured to

**i)** share

**(a)** at least one data primitive

**(b)** across at least two of

- the plurality of stored-video application programs.

**40.** The networked multimedia system of claim 39, wherein

**A)** the data primitive

**i)** is from the group consisting of

**(a)** a video file, a graphics event file, and a metafile.

**41.** The networked multimedia system of claim 40, wherein

**A)** the metafile includes at least one of the group of

**i)** an audio-video file, audio only file, video only file, a graphics event file, a window event file, an application startup event file, a bit map file, a postscript file, a graphics file, a synchronization file, and a text file.

**42.** The networked multimedia system of claim 41, wherein

**A)** the metafile includes

**i)** an associated pointer file

**B)** to define an omnifile..

**43.** The networked multimedia system of claim 39, wherein

**A)** the system is configured to

**i)** invoke of at least one of the process primitives and the data primitives as

**(a)** an attachment to the file,

**(b)** the attachment being acceptable by third parties according to a standard data interchange protocol.

**44.** The system of claim 43 wherein

**A)** the standard data interchange protocol

**i)** is a MIME protocol, and

**B)** the attachment

**i)** is a MIME attachment.

**45.** The system of claim 44, wherein the MIME attachment

**A)** invokes one of a viewer and a browser, and

**B)** initiates signal transfer along the signal path.

**46.** The system of claim 44, further comprising:

**A)** a plurality of applications

**i)** accessible by at least one of the workstations,

**ii)** the applications being rendered interoperable by at least one of

**(a)** file sharing by the copying of MIME attachments and

**(b)** connection sharing.

**47.** The networked multimedia system of any one of claims 31 to 46 wherein the system is configured to

**A)** establish real time data sharing sessions

**i)** between at least two workstations

**ii)** using a synchronized data sharing process

(a) as a shared conference window.

48. The system of claim 47, wherein

A) the synchronized data sharing process is shareboard, and

B) the use of shareboard renders

i) an application program simultaneously invocable on a plurality of workstations

(a) whereby a workstation user can

- access a file,
- import data as a window copy from the application program onto the video reproduction capability of a workstation,
- scroll through screens of the application program independent of other invocations of the applications on other workstations, and
- perform graphics functions utilizing graphics overlay files on the application program

i. independent of other invocations of the application program on other workstations.

49. The system of claim 48, further comprising at least one of the group of:

A) an authoring tool for at least one of

i) drawing objects on the shared conference window, and

ii) typing text on the shared conference window;

B) a grab tool for

i) grabbing another file program, and

ii) drawing at least a portion of the file program

(a) into the shared conference window; and

C) a telepointing tool

i) for independently pointing at objects

(a) on the shared conference window.

**50.** The networked multimedia system of any one of claims 31 to 46, further comprising:

A) at least one video conference application for

i) establishing a video conference session

(a) among the interconnected workstations, and

B) a video conference recording application for

(a) recording at least a portion

- of the established video conference session
- on at least one storage cell.

**51.** The system of claim 50, wherein

A) the video conference recording application

i) is implemented at the option of at least one user.

**52.** The system of claim 50, wherein

A) the video conference recording application

i) is automatically implemented as at least one of

(a) an element of a video conference call initiator, and

(b) an element of a video conference call control routine.

**53.** The system of claim 50, wherein

A) the signal path includes at least

i) a conference bridge

(a) which is invoked at the initiation of the video conference recording application.

**54.** The system of claim 50, wherein

A) the signal path includes at least one

i) conference bridge

**(a)** previously invoked at the initiation of the video conference session.

**55.** The system of claim 50, wherein

**A)** the signal path includes

**i)** a conference bridge port

**(a)** providing a global view of the video conference session participants.

**56.** The system of claim 50, wherein

**A)** the signal path includes

**i)** a normally configured conference bridge port

**(a)** treated as a standard user port on the conference bridge.

**57.** The networked multimedia system of any one of claims 31 to 46 further comprising:

**A)** at least one video mail application configured to do at least one of

**i)** author a video mail message for transmission to the storage cell and

**ii)** read a video mail message previously stored on the storage cell.

**58.** The system of claim 57, wherein

**A)** the video mail application includes

**i)** a MIME-based video attachment capability

**(a)** provided to an existing MIME-based mail application.

**59.** The system of claim 57, wherein

**A)** the video mail application is configured to

**i)** share

**(a)** a video mail message

- across a plurality of workstations as

**(b)** a broadcast video e-mail,

- thereby requiring the storage of fewer copies of the message than the number of the plurality of workstations receiving the broadcast video e-mail.

**60.** The networked multimedia system of any one of claims 31 to 46, wherein the system is configured to

**A)** to record

**B)** on a storage cell, at least one of

**i)** an audio and video message, and

**ii)** a multimedia message

**C)** from an incoming caller.

**61.** The system of claim 60 further configured to

**A)** record the video message

**i)** on one of

**(a)** the recipient's storage cell, and

**(b)** the caller's storage cell such that

**ii)** the message is stored to optimize at least one of

**(a)** message availability,

**(b)** system overhead for system network configuration, and

**(c)** system data storage facilities.

**62.** The system of claim 60, further configured to

**A)** respond to a call

**i)** to a workstation user

**ii)** by producing a recorded greeting selected from the group consisting of

**(a)** a stored video greeting,

**(b)** a text greeting, and

**(c)** a graphics greeting.

**63.** The system of claim 62, wherein

**A)** the recorded greeting

**i)** is stored on a storage cell

**ii)** associated with the workstation user.

**64.** The system of claim 62, wherein

**A)** at least one recorded greeting

**B)** is stored on a plurality of storage cells.

**65.** A networked multimedia system comprising:

**A)** a plurality of workstations, each including

**i)** video and audio reproduction capabilities, and

**ii)** video and audio capture capabilities;

**B)** at least one signal converter configured to

**i)** convert audio and/or video information

**(a)** originating at a workstation,

**(b)** into a form suitable for storage

**C)** at least one storage cell configured to

**i)** store,

**(a)** audio and video information

- captured at a workstation

**(b)** as at least one file,

- for later retrieval;

**D)** at least one signal path,

**i)** interconnecting the workstations, the converter(s) and the storage cell(s)

**E)** wherein the system is configured to

i) enable files

(a) stored on a storage cell

(b) to be included in an on-line electronic document.

**66.** The system of claim 65 where the system

A) provides access to stored files

i) by utilizing a standardized attachment methodology.

**67.** The system of claim 66, wherein

A) the standardized attachment methodology is MIME.

**68.** The system of claim 66, wherein

A) the files are selected from the group consisting of

i) archival video, video overlay graphics, and a compendium of a plurality of video files which further include at least one of additional text or graphics, standalone videos, and MIME attached video files.

**69.** A networked multimedia system comprising:

A) a plurality of workstations, each including

i) video and audio reproduction capabilities, and

ii) video and audio capture capabilities;

B) at least one signal converter configured to

i) convert audio and/or video information

(a) originating at a workstation,

(b) into a form suitable for storage

C) at least one storage cell configured to

i) store,

(a) audio and video information

- captured at a workstation

(b) as at least one file,

- for later retrieval;

**D)** at least one network providing

**i)** a signal path,

**(a)** interconnecting the workstations, the converter(s) and the storage cell(s)

**E)** wherein the system defines a proxy server configured to do at least one of

**i)** reducing the total number of copies of video files by file sharing,

**ii)** reducing network load by transporting video files over a separate audio-video network,

**iii)** transcoding among multiple audio-video formats, and

**iv)** allowing any one of the workstations to serve as a video publisher for the system.

**70.** The system of claim 69, wherein

**A)** the workstation serves as a video publisher

**i)** subject to user permissions.

**71.** The system of claim 69, wherein the system is configured

**A)** as an intranet video storage server for at least one of

**i)** reducing the total number of copies of video files in the enterprise by file sharing,

**ii)** reducing enterprise network load by transporting video files over a separate audio-video network,

**iii)** transcoding among multiple audio-video formats, and

**iv)** allowing any audio-video workstation in the enterprise to serve as a video publisher for the enterprise.

**72.** The networked multimedia system of claim 69, wherein

**A)** the system is configured as a proxy server

**i)** enabling the implementation of at least one animated annotation on the internet.

**73.** The system of claim 72, wherein

**A)** at least one of the animated annotations

**i)** is synchronized with respect to one or more of

**(a)** an accompanying video file,

**(b)** an accompanying audio file.

**74.** The system of claim 71, further configured to

**A)** enable the authoring of an animated annotation utilizing a window-sharing tool.

**75.** The system of claim 74, wherein

**A)** the window-sharing tool is selected from the group consisting of

**i)** a shareboard application and an interactive meeting enabling computer application.

Figure 1

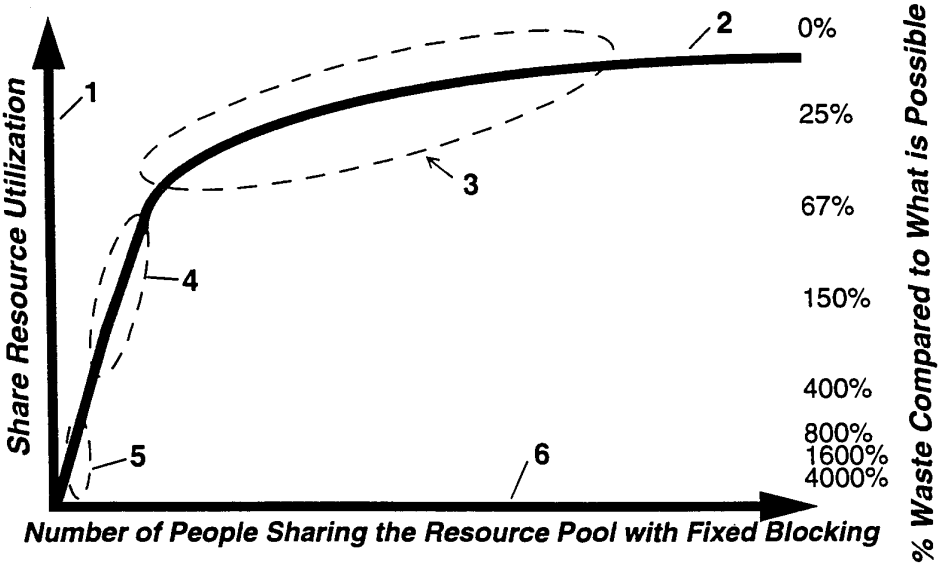

Share Resource Utilization
1
2
3
4
5
6
0%
25%
67%
150%
400%
800%
1600%
4000%
% Waste Compared to What is Possible
Number of People Sharing the Resource Pool with Fixed Blocking

Figure 2

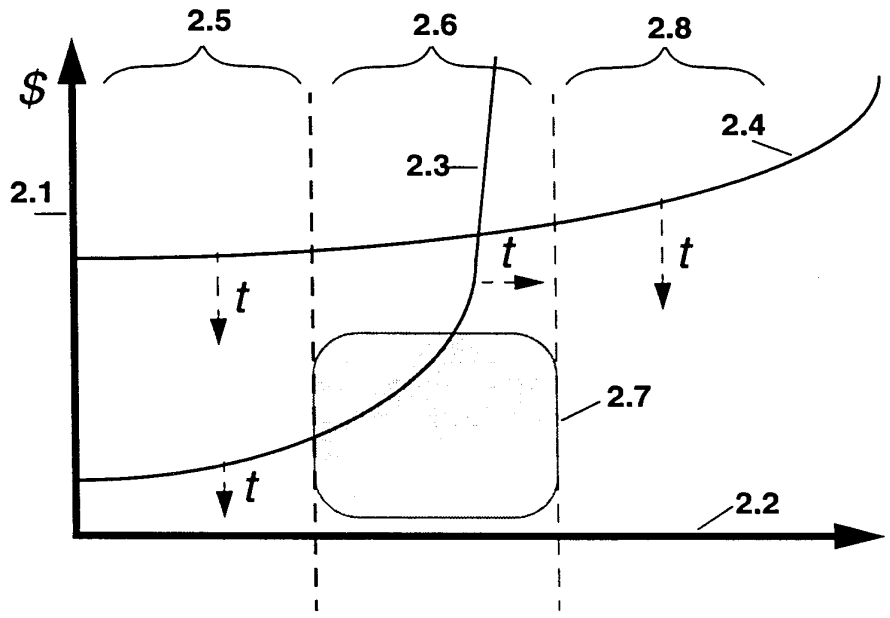
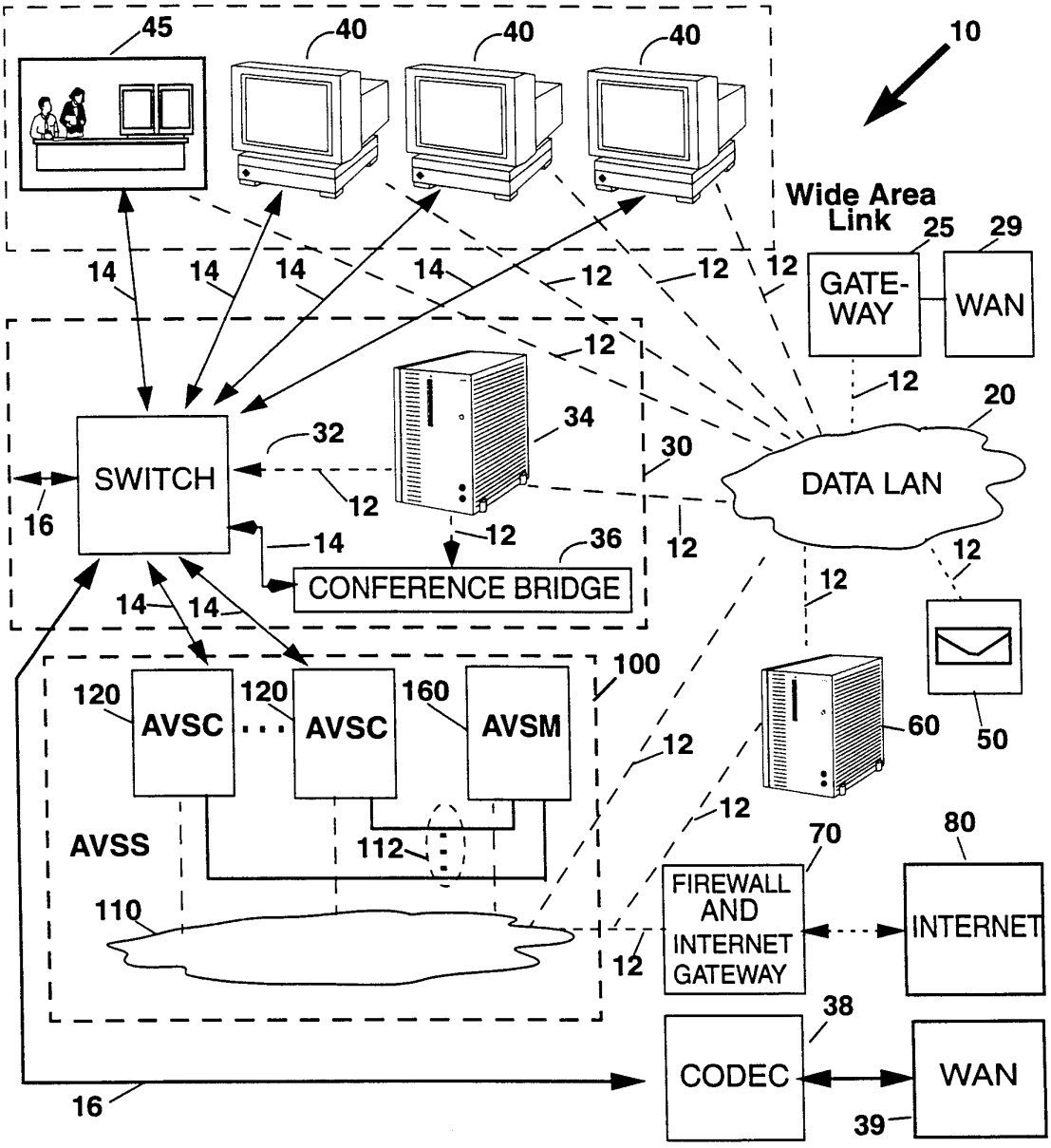
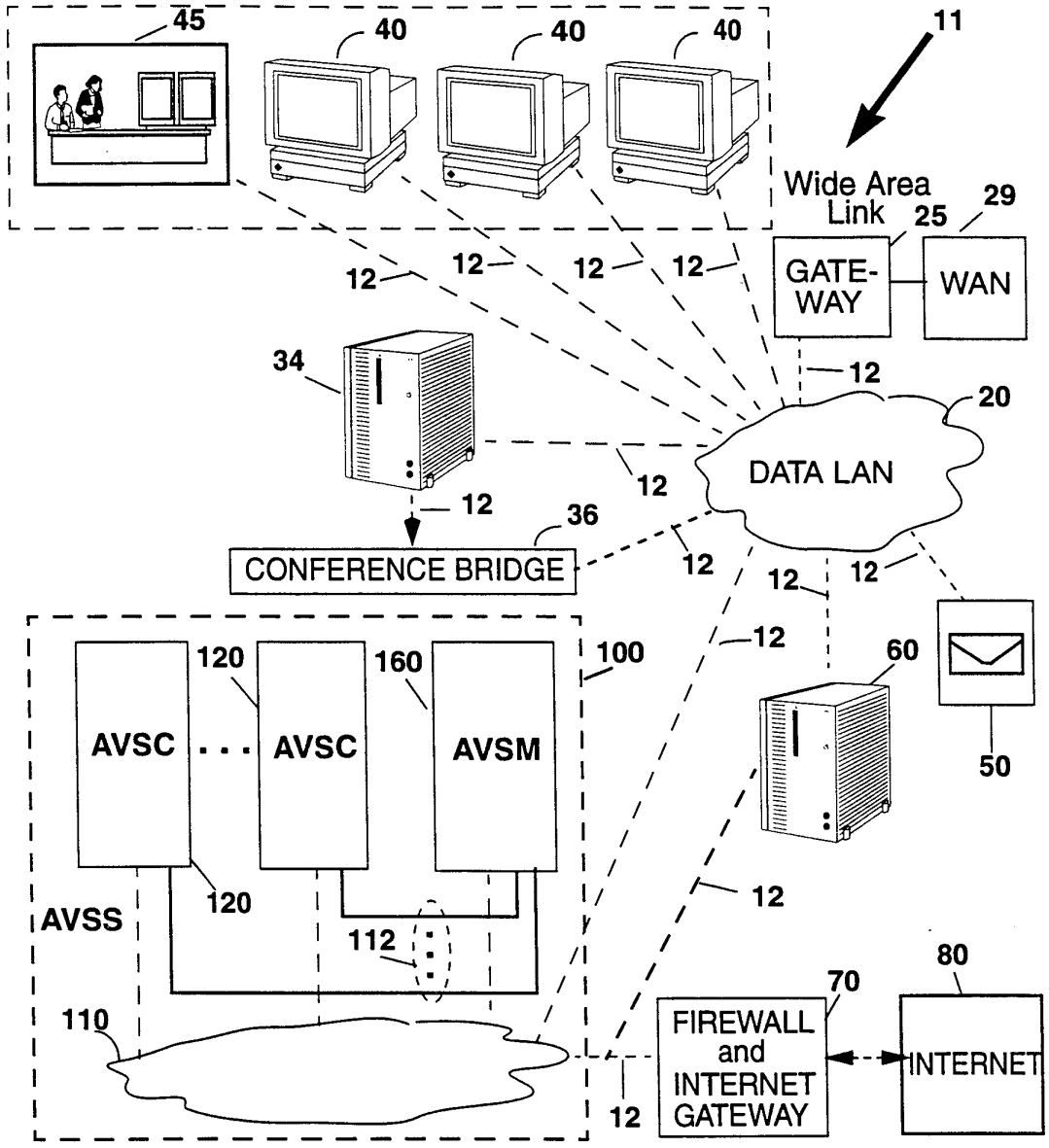


Figure 3


45
40
40
40
10
Wide Area Link
25
29
GATE-WAY
WAN
14
14
14
14
12
12
12
12
12
20
34
32
30
SWITCH
DATA LAN
16
12
14
12
36
12
12
CONFERENCE BRIDGE
12
14
14
100
120
AVSC
120
AVSC
160
AVSM
60
50
12
12
AVSS
112
70
80
110
FIREWALL AND INTERNET GATEWAY
INTERNET
12
38
CODEC
WAN
16
39

3/46

Figure 4


45
40
40
40
11
Wide Area Link
25
29
GATE-WAY
WAN
12
34
20
DATA LAN
36
CONFERENCE BRIDGE
60
50
100
120
160
AVSC
AVSC
AVSM
AVSS
112
110
70
80
FIREWALL and INTERNET GATEWAY
INTERNET

4/46

Figure 5

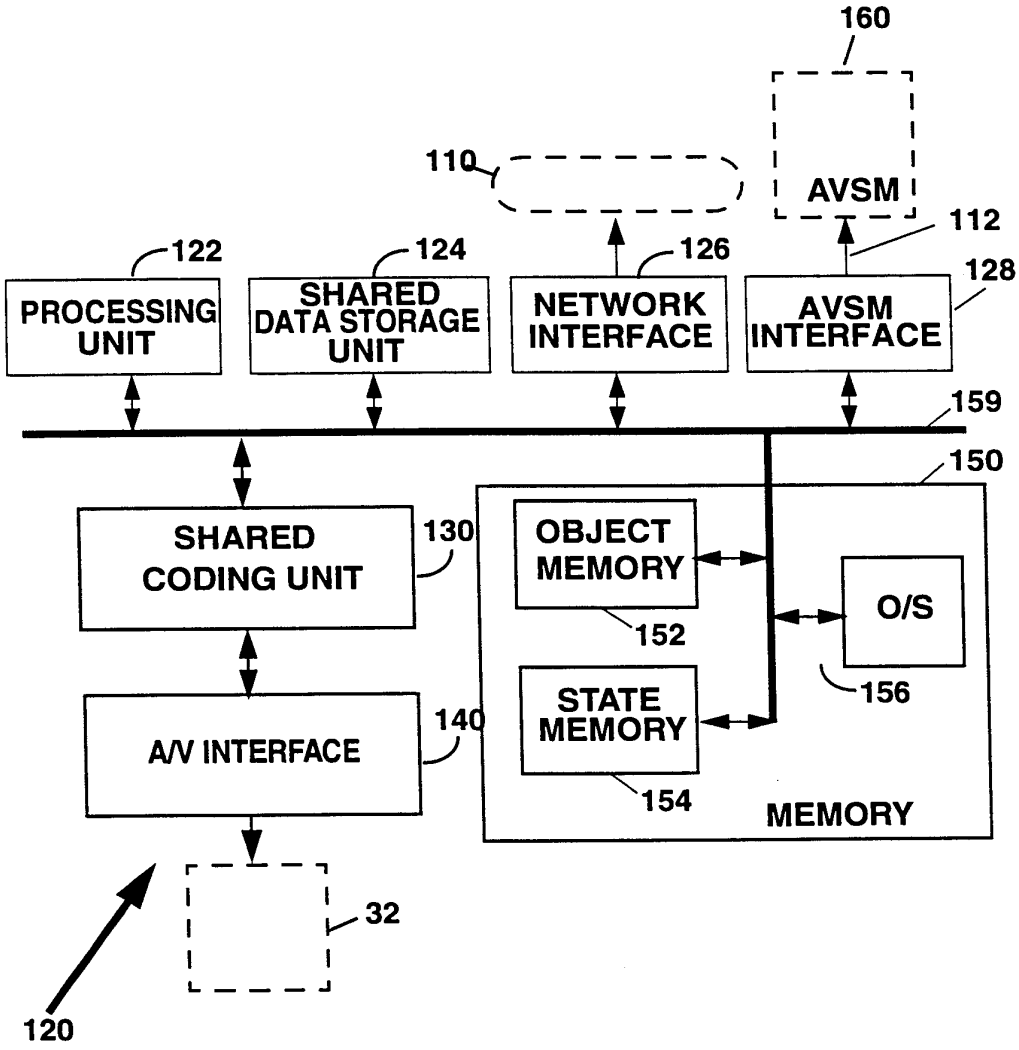

160
AVSM
110
112
122
124
126
128
PROCESSING UNIT
SHARED DATA STORAGE UNIT
NETWORK INTERFACE
AVSM INTERFACE
159
150
SHARED CODING UNIT
130
OBJECT MEMORY
152
O/S
156
STATE MEMORY
154
MEMORY
A/V INTERFACE
140
32
120

Figure 6

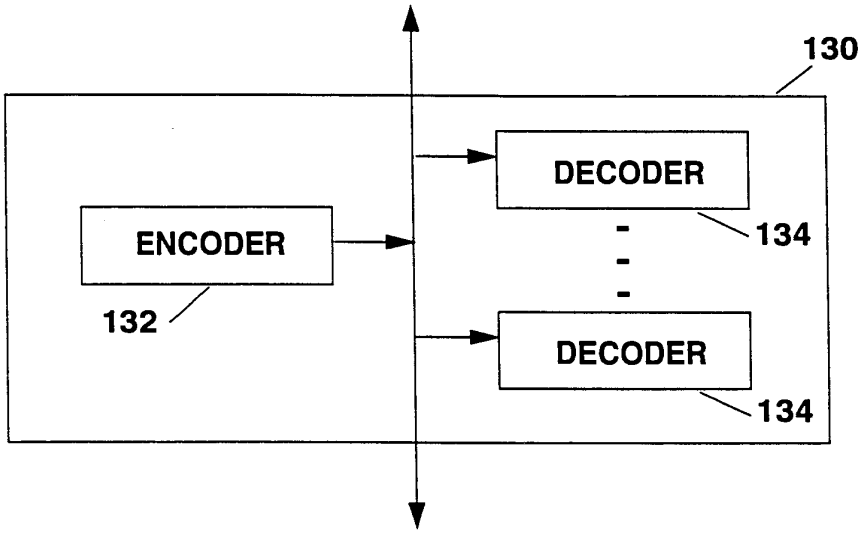


Figure 7

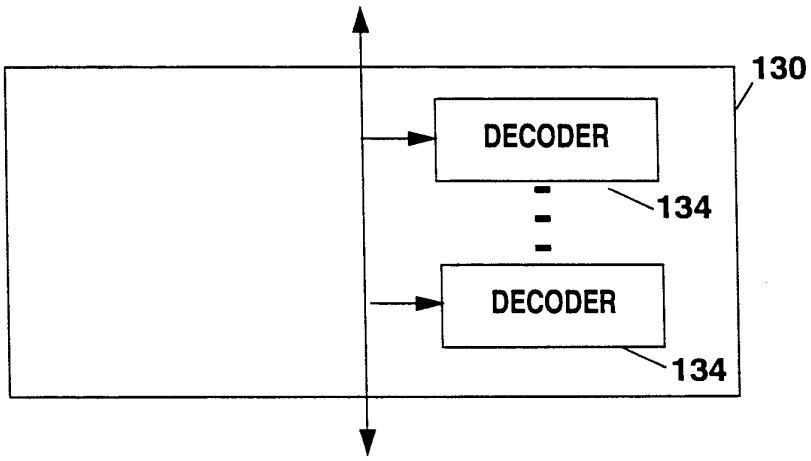


Figure 8

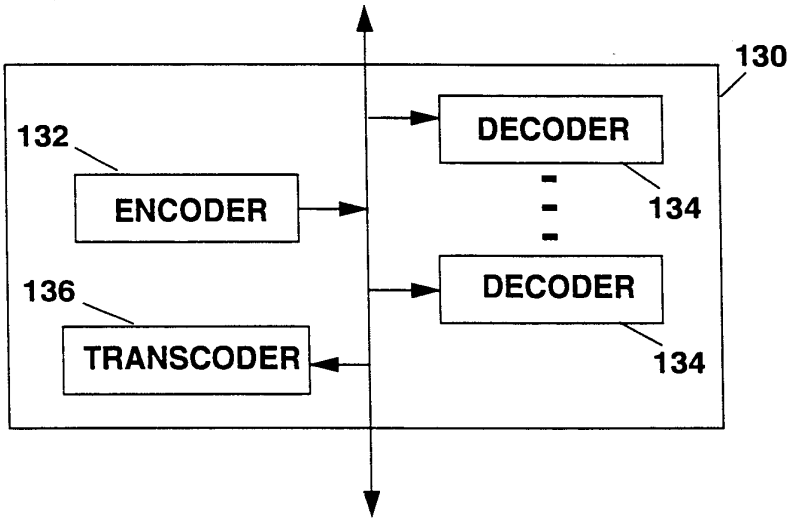


Figure 9

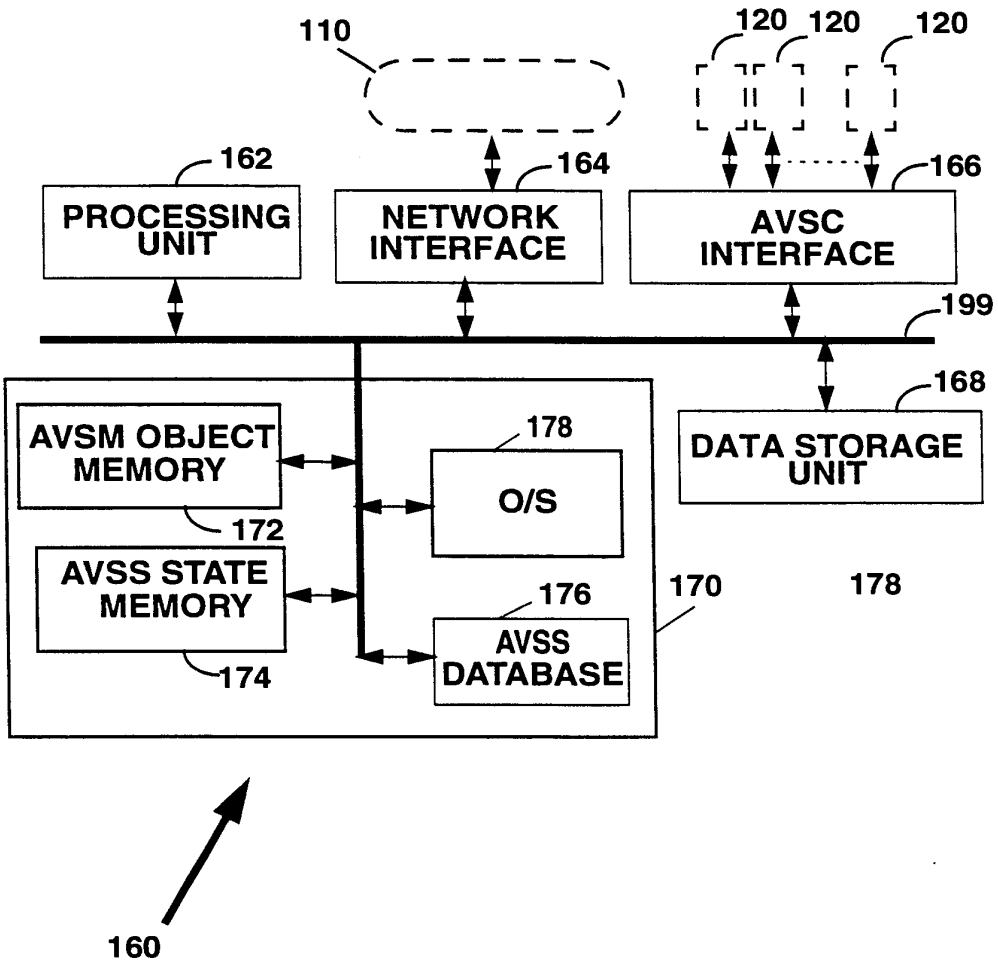

110
120
120
120
162
164
166
PROCESSING UNIT
NETWORK INTERFACE
AVSC INTERFACE
199
168
AVSM OBJECT MEMORY
178
O/S
DATA STORAGE UNIT
172
AVSS STATE MEMORY
176
170
178
AVSS DATABASE
174
160

Figure 10

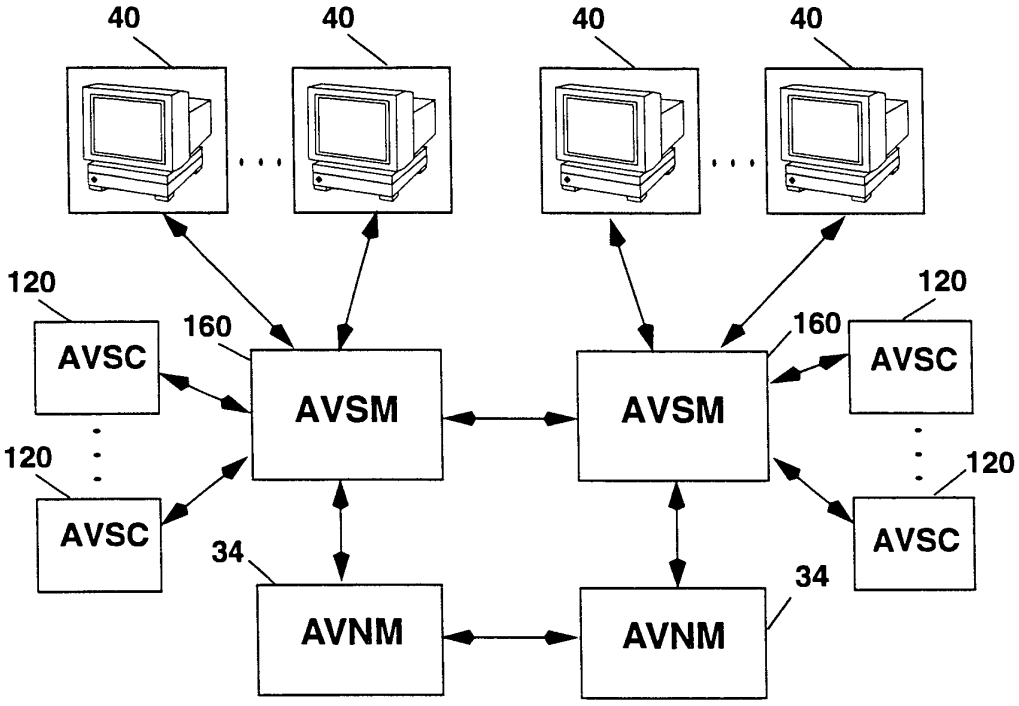

40
40
40
40
120
AVSC
160
AVSM
AVSM
160
120
AVSC
120
AVSC
120
AVSC
34
AVNM
AVNM
34

Figure 11

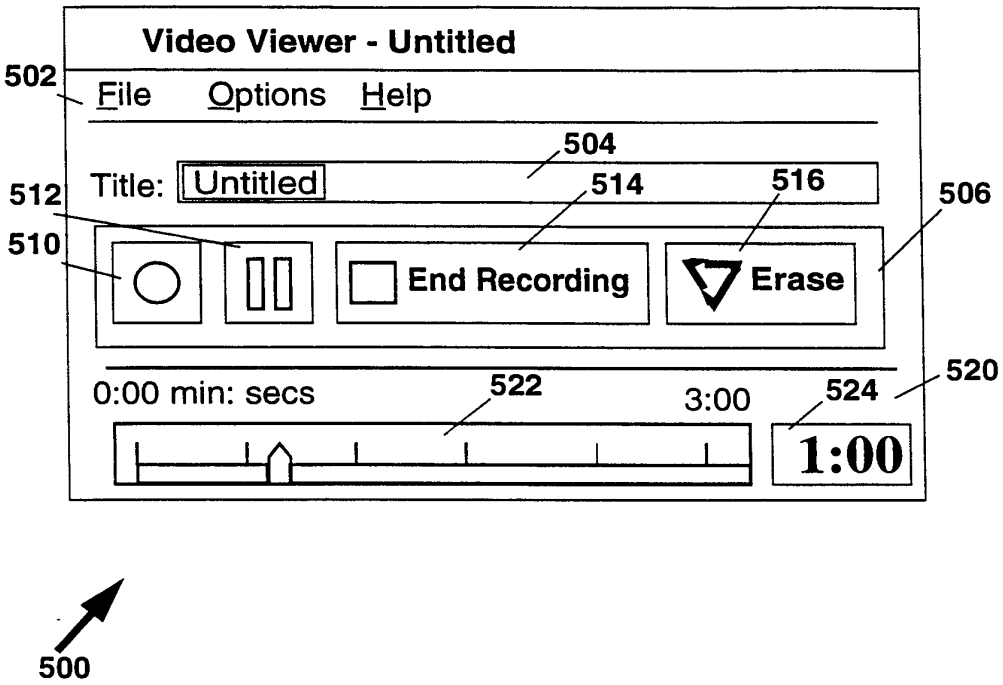

Video Viewer - Untitled
502
File Options Help
504
Title: Untitled
514
516
512
506
510
End Recording
Erase
520
0:00 min: secs
522
3:00
524
1:00
500

Figure 12

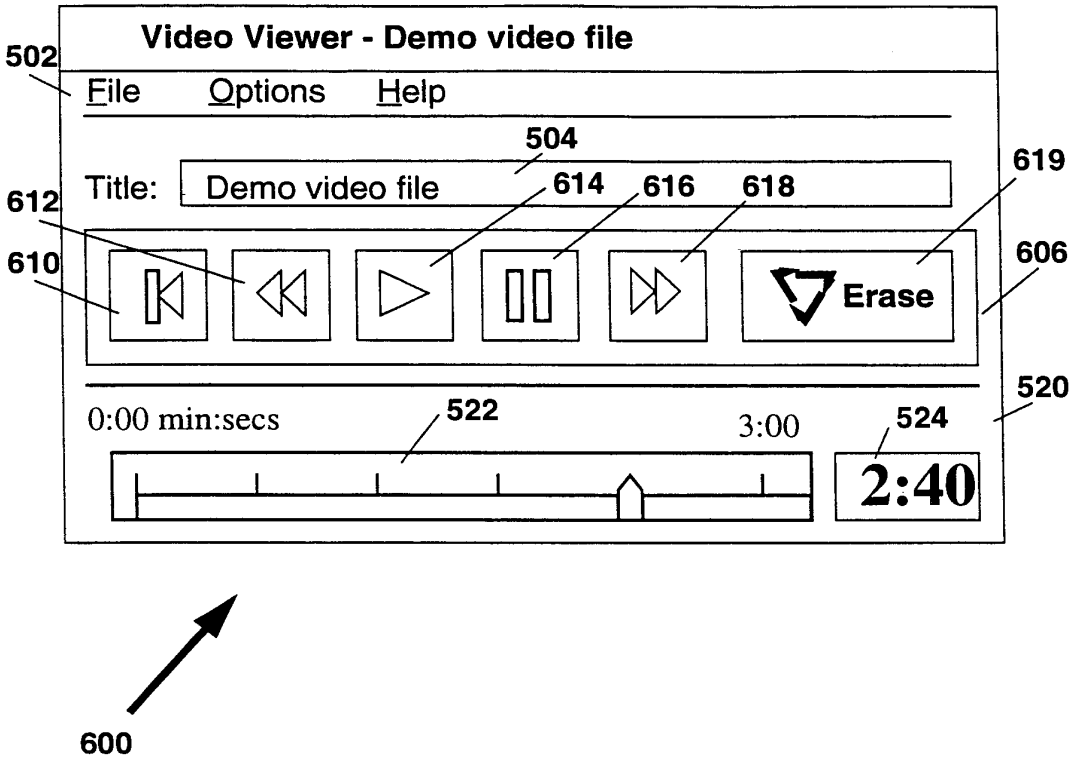

Video Viewer - Demo video file
502
File
Options
Help
504
Title:
Demo video file
614
616
618
619
612
610
606
Erase
520
0:00 min:secs
522
3:00
524
2:40
600

Figure 13

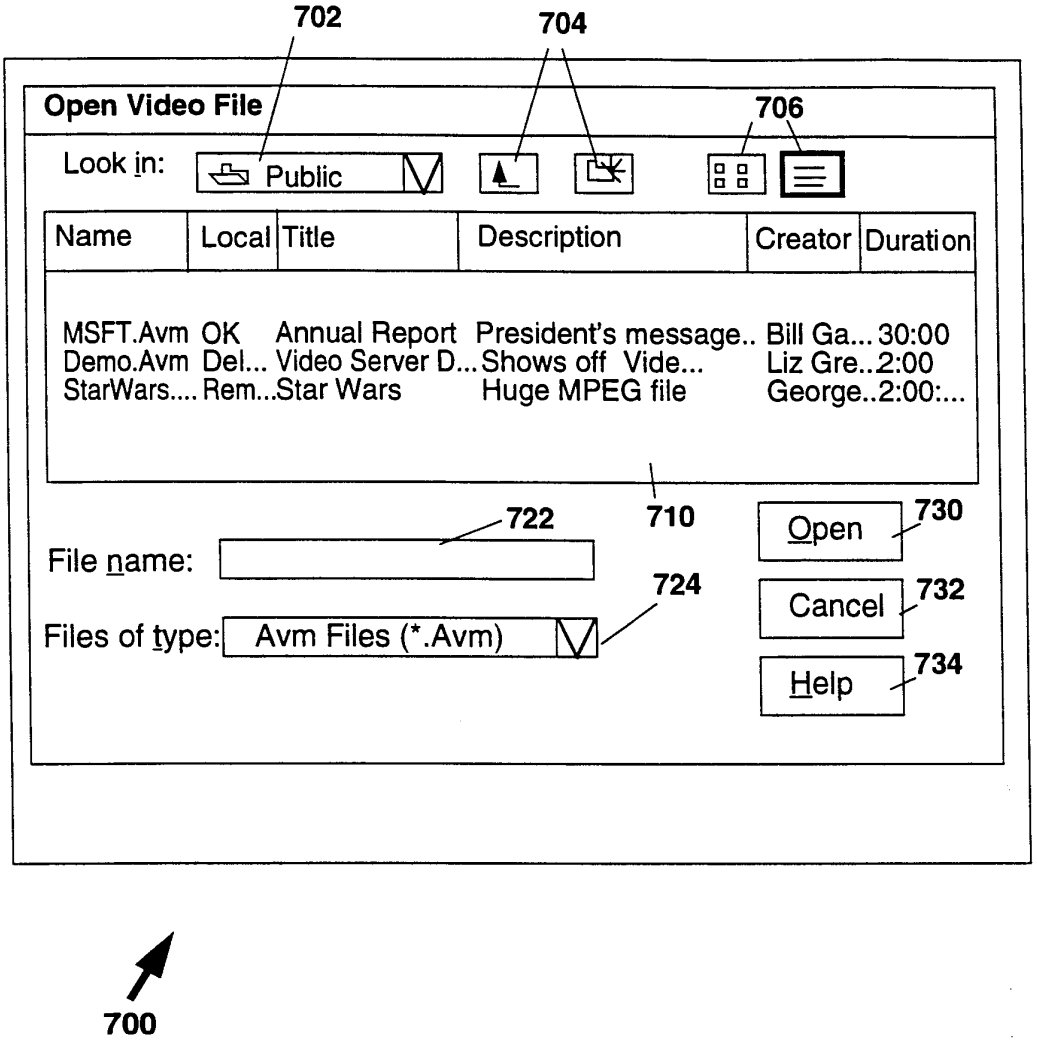
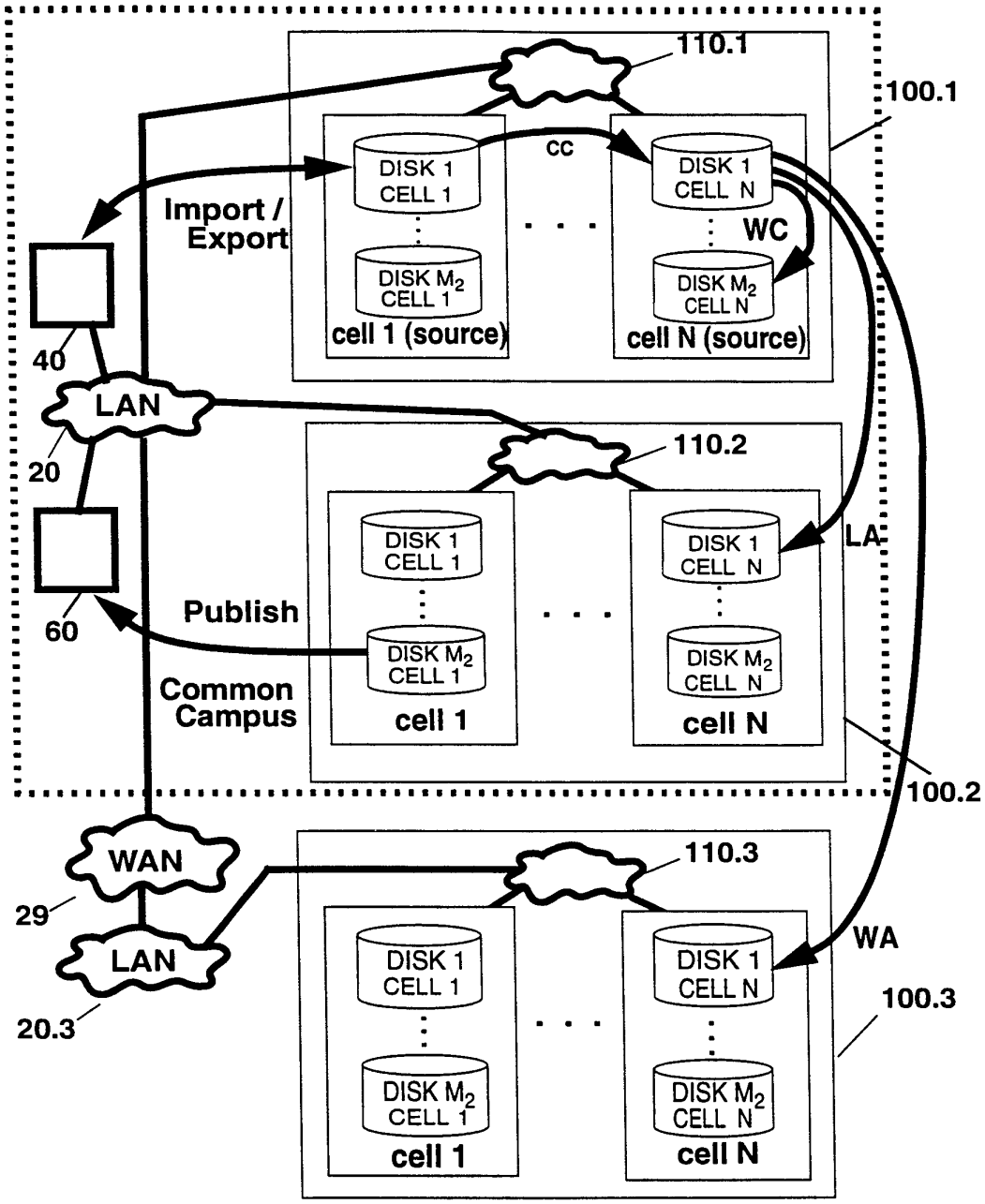

702
704
706
Open Video File
Look in:
Public
Name
Local
Title
Description
Creator
Duration
MSFT.Avm OK Annual Report President's message.. Bill Ga... 30:00
Demo.Avm Del... Video Server D... Shows off Vide... Liz Gre..2:00
StarWars.... Rem...Star Wars Huge MPEG file George..2:00:...
710
722
File name:
724
Files of type:
Avm Files (*.Avm)
Open
730
Cancel
732
Help
734
700

Figure 14




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Figure 15

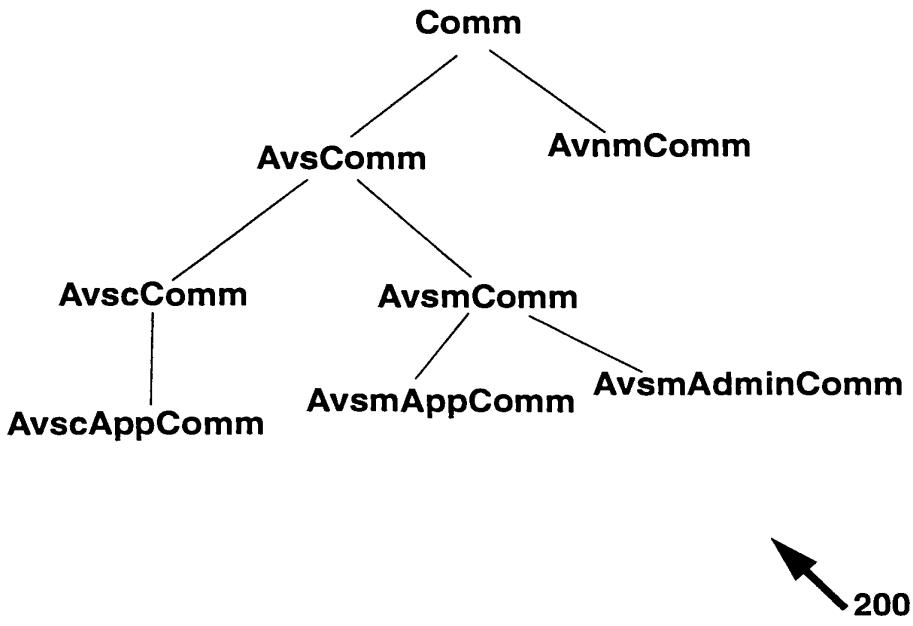
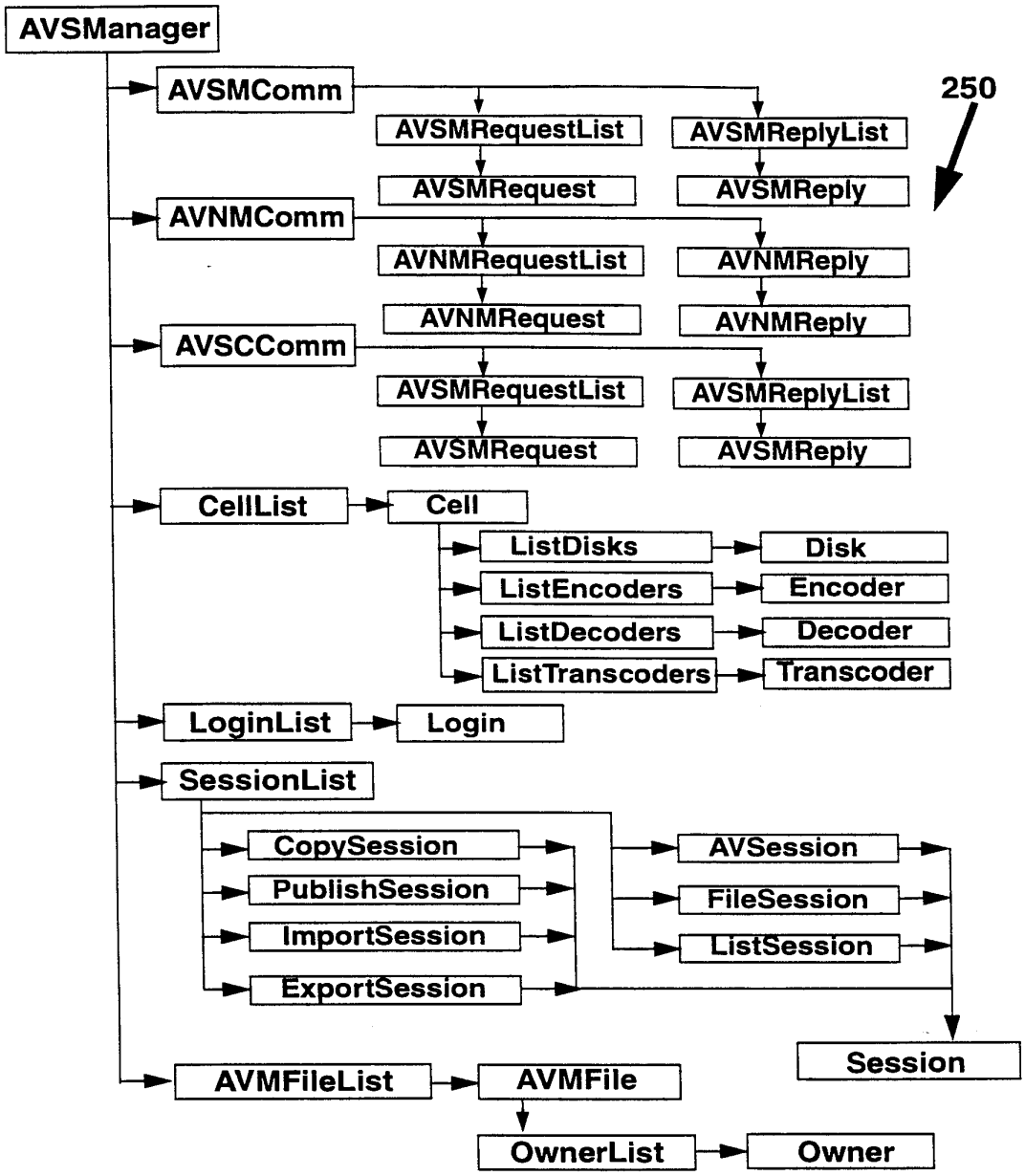
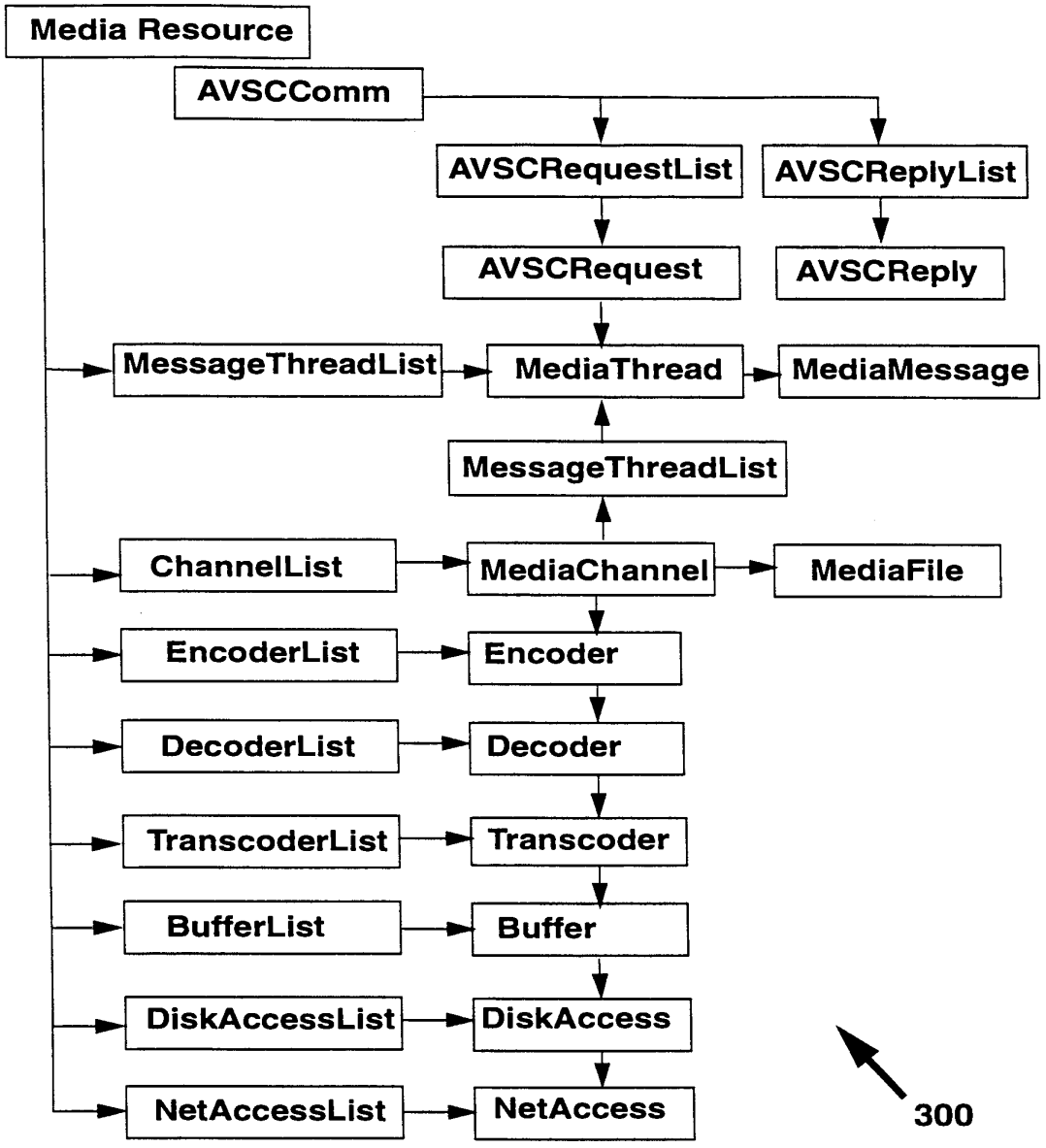

Comm
AvsComm
AvnmComm
AvscComm
AvsmComm
AvscAppComm
AvsmAppComm
AvsmAdminComm
200

Figure 16




*16/46*

Figure 17




17/46

Figure 18

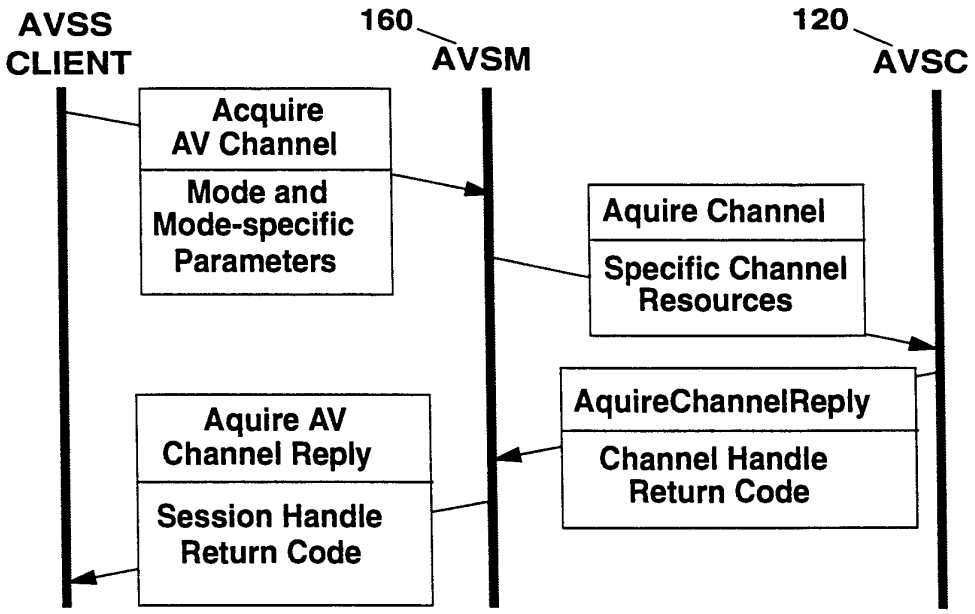

AVSS
CLIENT
160
AVSM
120
AVSC
Acquire
AV Channel
Mode and
Mode-specific
Parameters
Aquire Channel
Specific Channel
Resources
AquireChannelReply
Channel Handle
Return Code
Aquire AV
Channel Reply
Session Handle
Return Code

Figure 19

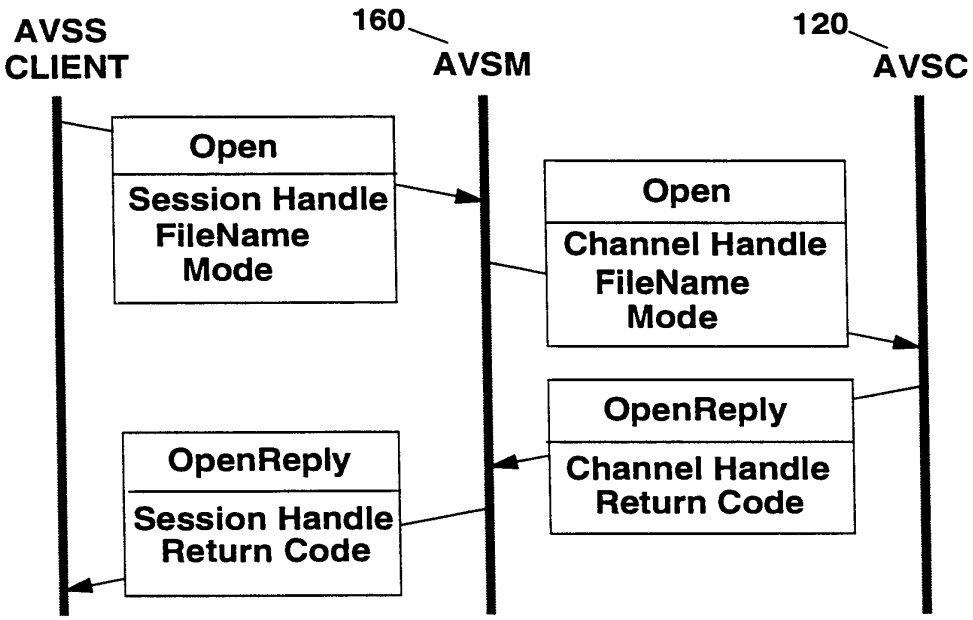

AVSS
CLIENT
160
AVSM
120
AVSC
Open
Session Handle
FileName
Mode
Open
Channel Handle
FileName
Mode
OpenReply
Channel Handle
Return Code
OpenReply
Session Handle
Return Code

Figure 20

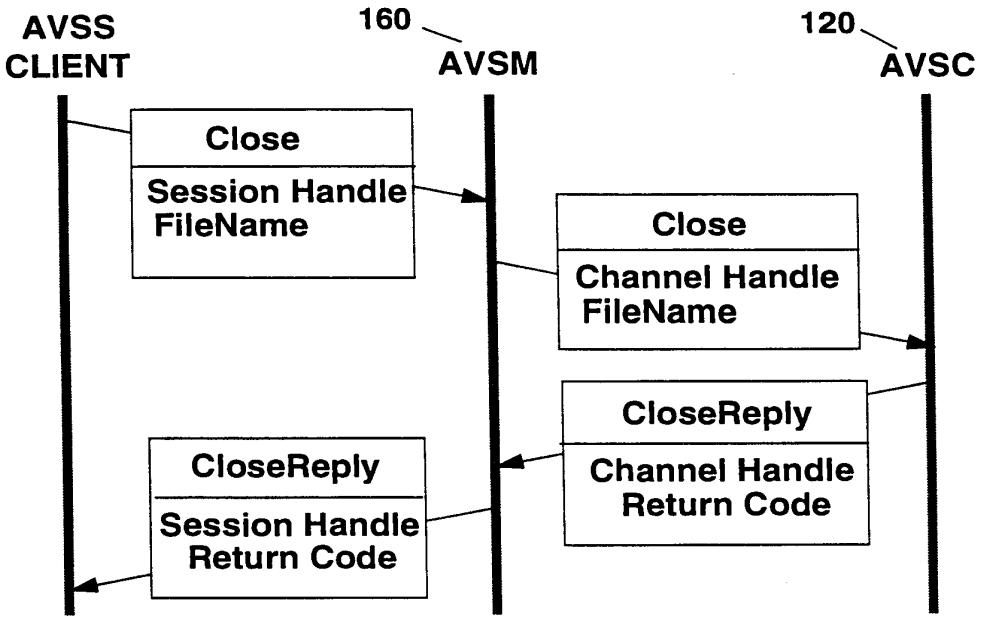

AVSS
CLIENT
160
AVSM
120
AVSC
Close
Session Handle
FileName
Close
Channel Handle
FileName
CloseReply
Channel Handle
Return Code
CloseReply
Session Handle
Return Code

Figure 21

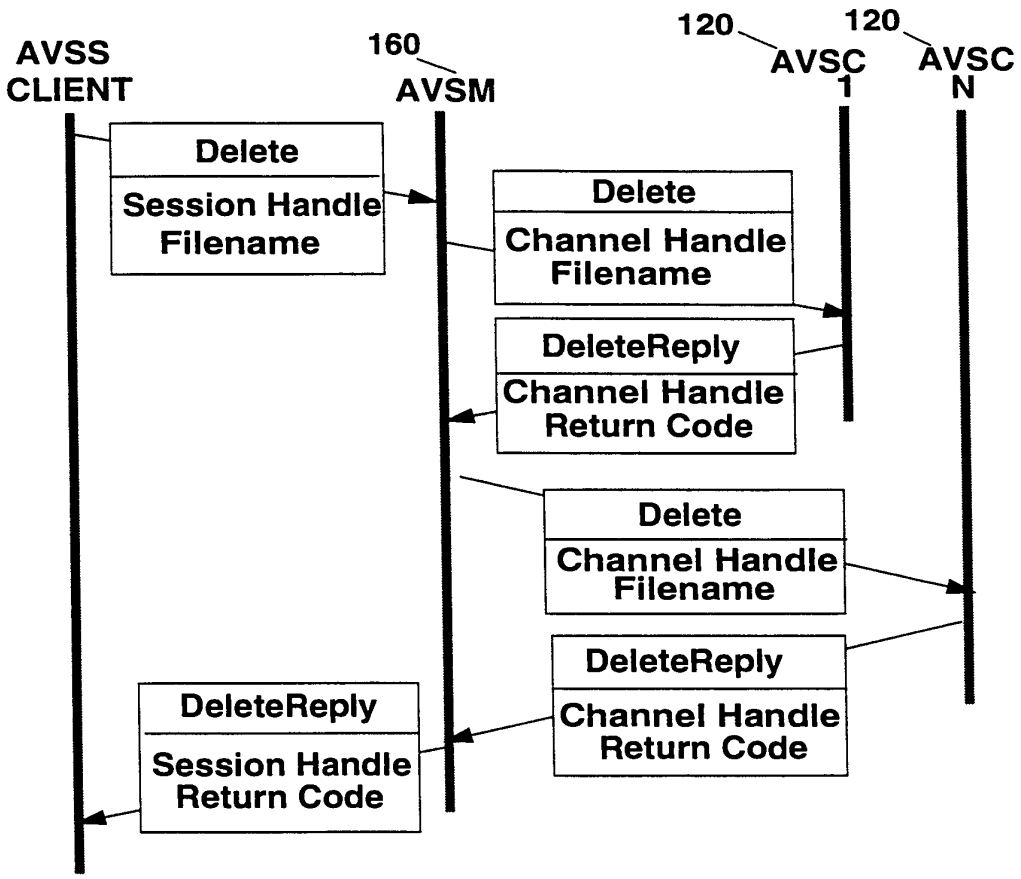

AVSS CLIENT
160 AVSM
120 AVSC 1
120 AVSC N
Delete
Session Handle Filename
Delete
Channel Handle Filename
DeleteReply
Channel Handle Return Code
Delete
Channel Handle Filename
DeleteReply
Channel Handle Return Code
DeleteReply
Session Handle Return Code

Figure 22

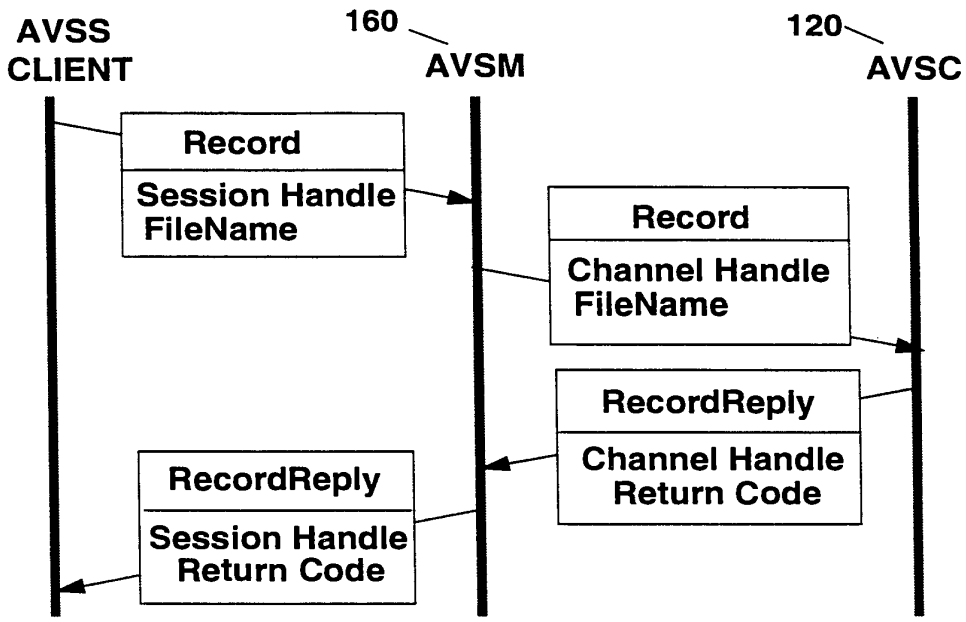

AVSS
CLIENT
160
AVSM
120
AVSC
Record
Session Handle
FileName
Record
Channel Handle
FileName
RecordReply
Channel Handle
Return Code
RecordReply
Session Handle
Return Code

Figure 23

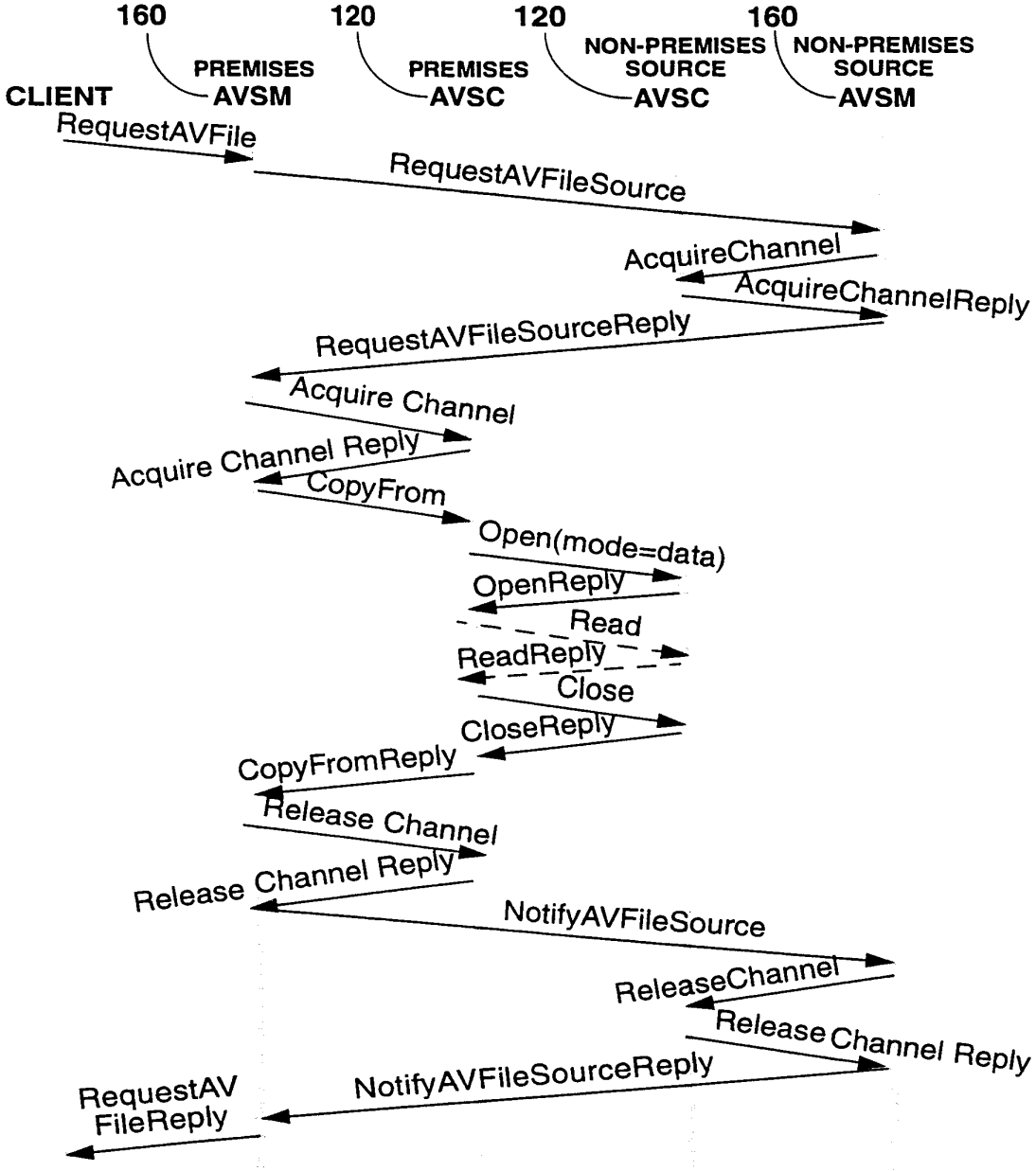
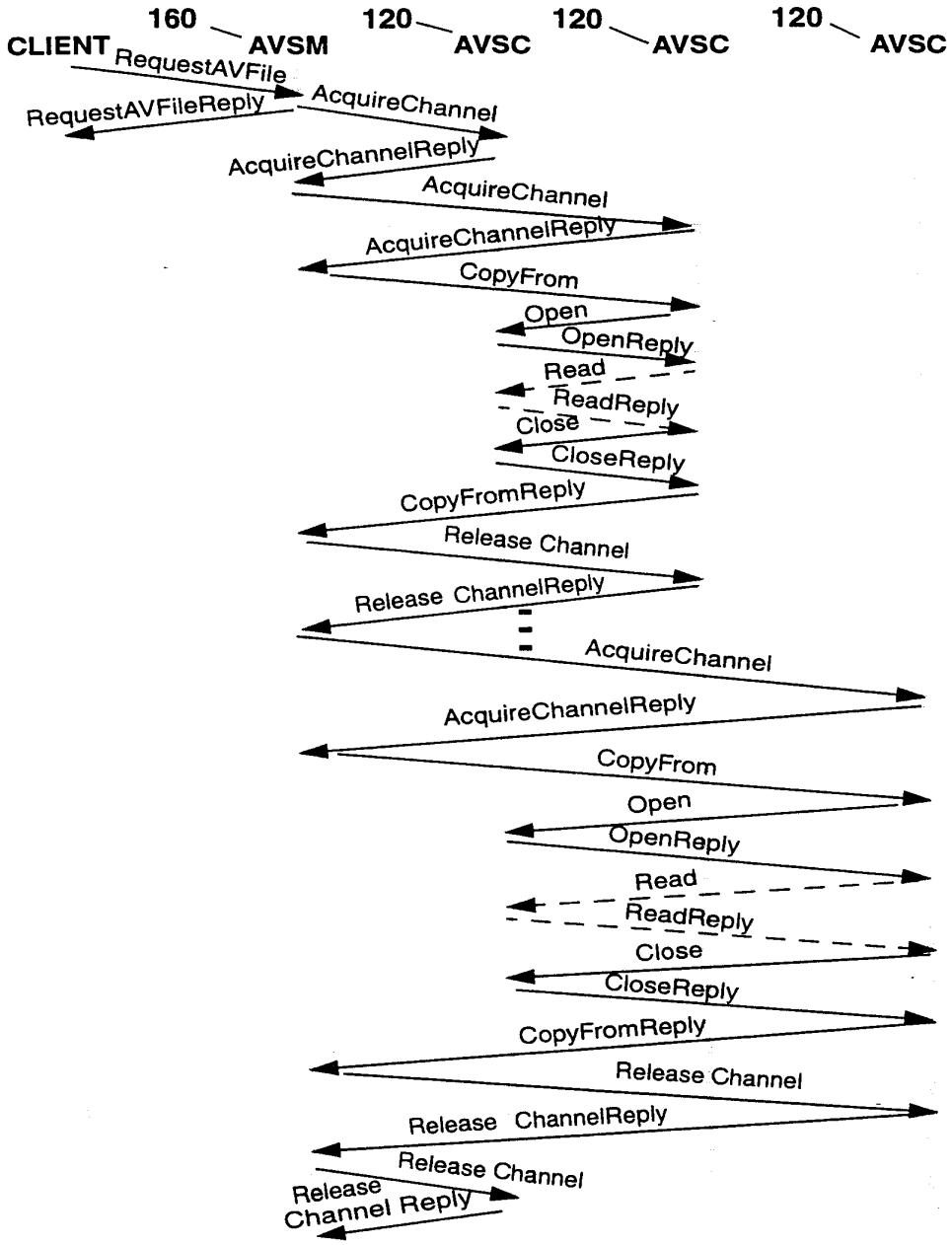

160
120
120
160
PREMISES
AVSM
PREMISES
AVSC
NON-PREMISES SOURCE
AVSC
NON-PREMISES SOURCE
AVSM
CLIENT
RequestAVFile
RequestAVFileSource
AcquireChannel
AcquireChannelReply
RequestAVFileSourceReply
Acquire Channel
Acquire Channel Reply
CopyFrom
Open(mode=data)
OpenReply
Read
ReadReply
Close
CloseReply
CopyFromReply
Release Channel
Release Channel Reply
NotifyAVFileSource
ReleaseChannel
Release Channel Reply
NotifyAVFileSourceReply
RequestAV FileReply

Figure 24




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Figure 25

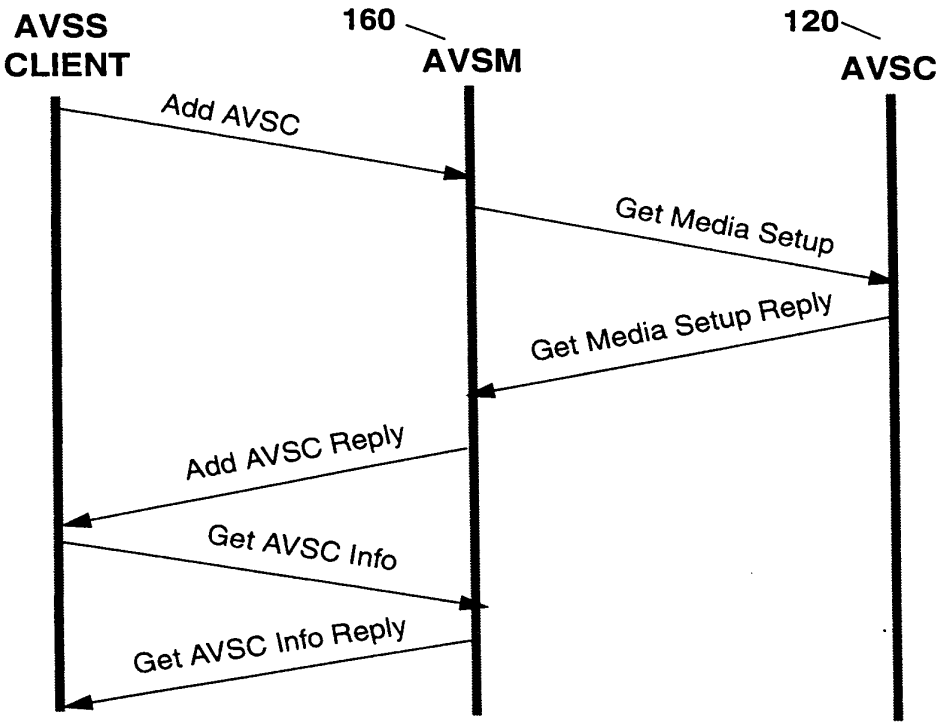

AVSS
CLIENT
160
AVSM
120
AVSC
Add AVSC
Get Media Setup
Get Media Setup Reply
Add AVSC Reply
Get AVSC Info
Get AVSC Info Reply

Figure 26

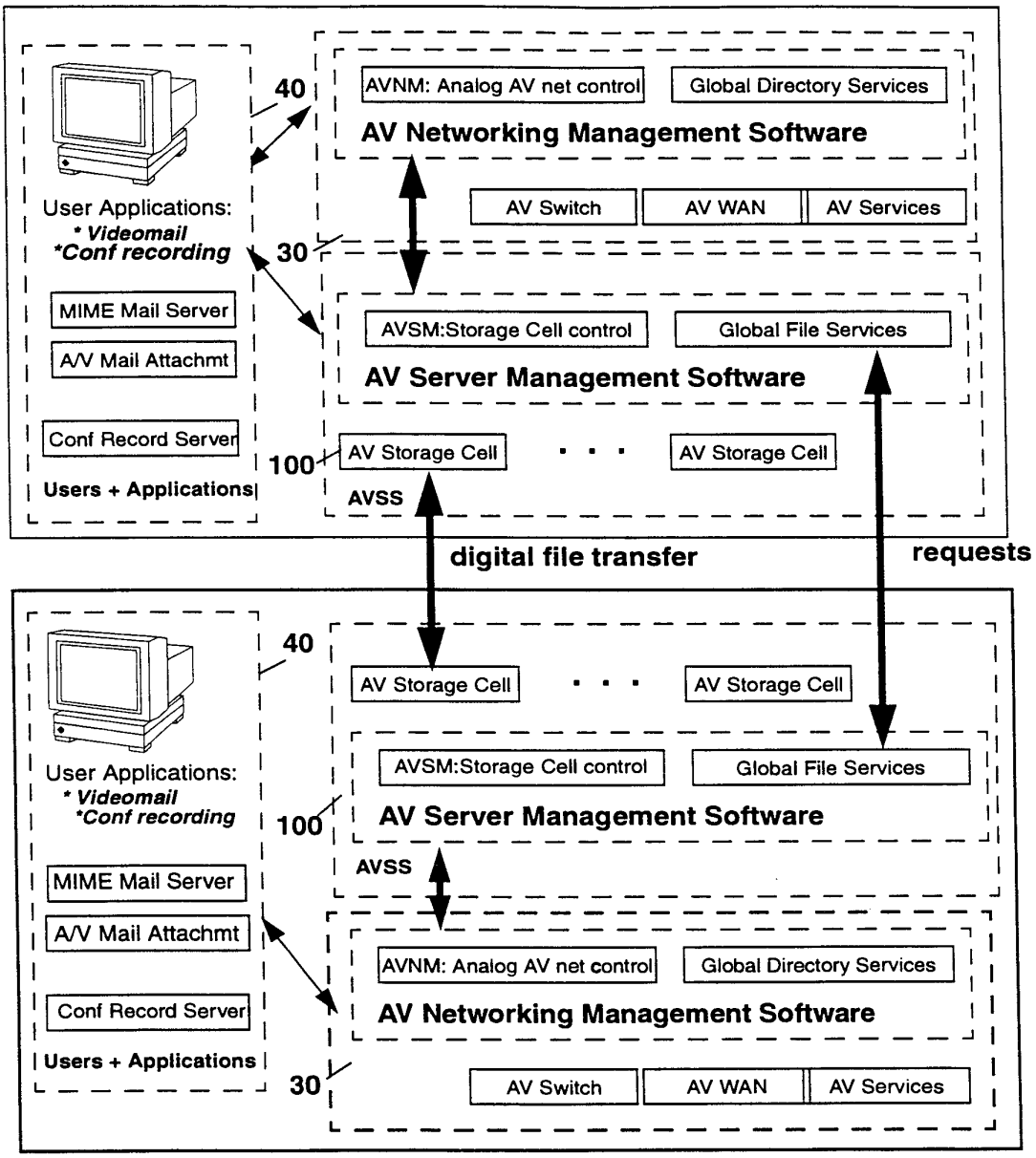

AVNM: Analog AV net control
Global Directory Services
AV Networking Management Software
AV Switch
AV WAN
AV Services
40
30
User Applications:
* Videomail
*Conf recording
MIME Mail Server
A/V Mail Attachmt
Conf Record Server
Users + Applications
AVSM:Storage Cell control
Global File Services
AV Server Management Software
AV Storage Cell
AV Storage Cell
100
AVSS
digital file transfer
requests

Figure 27

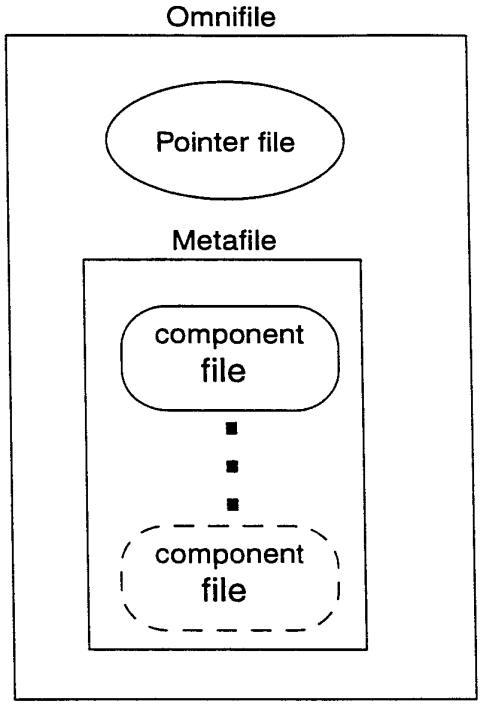

Omnifile
Pointer file
Metafile
component file
component file

Figure 28

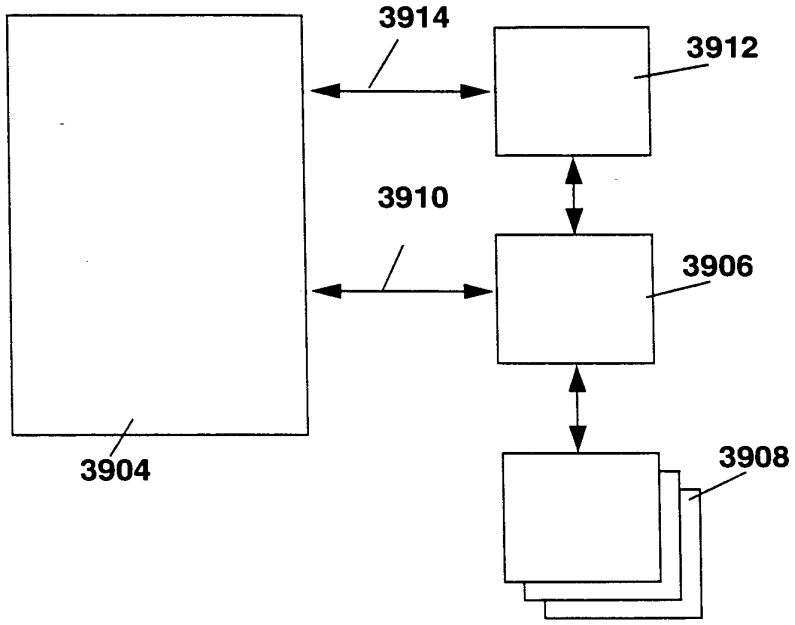


Figure 29

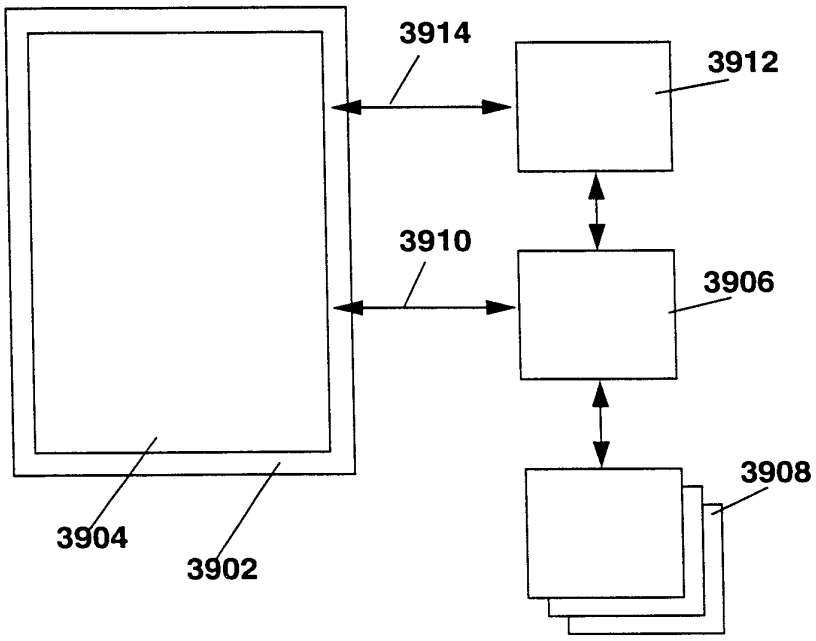
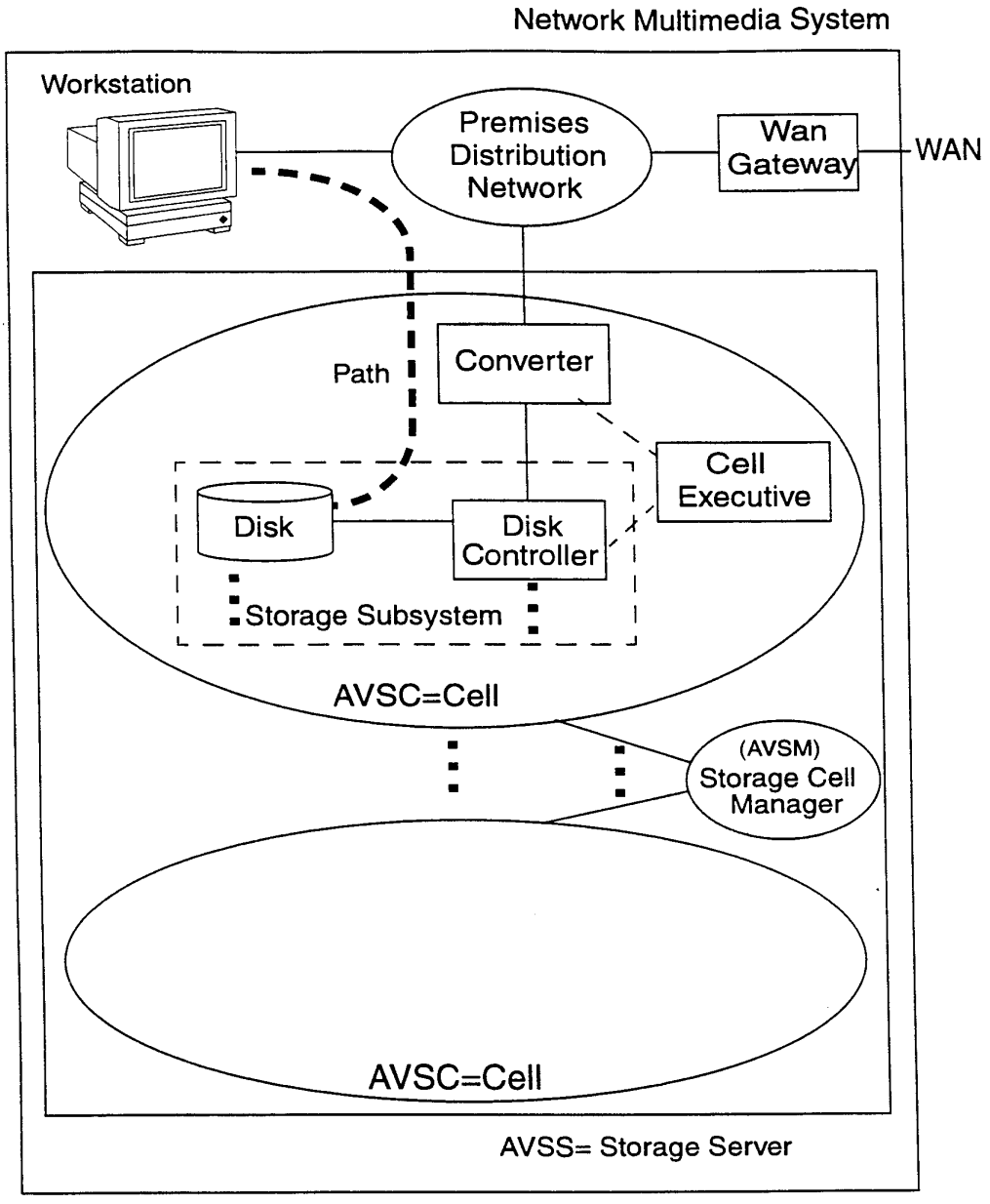
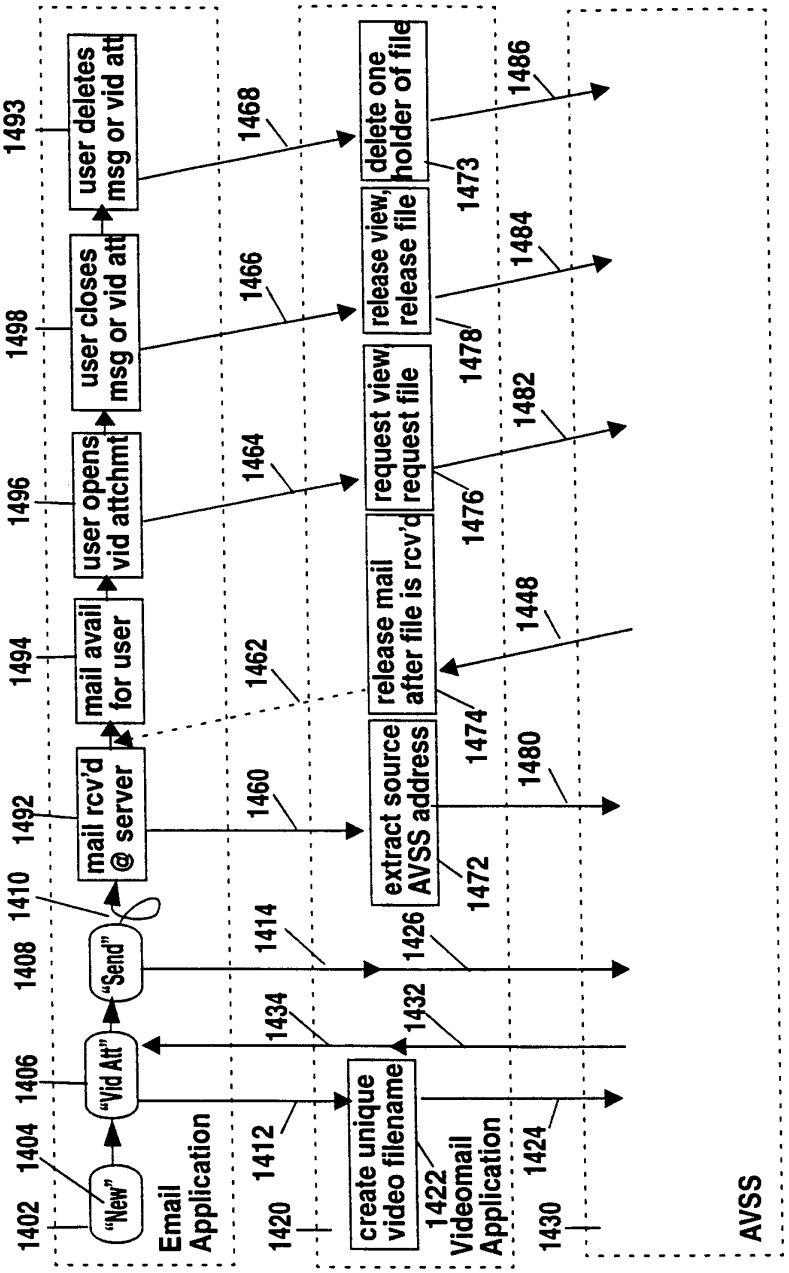


**Figure 30**



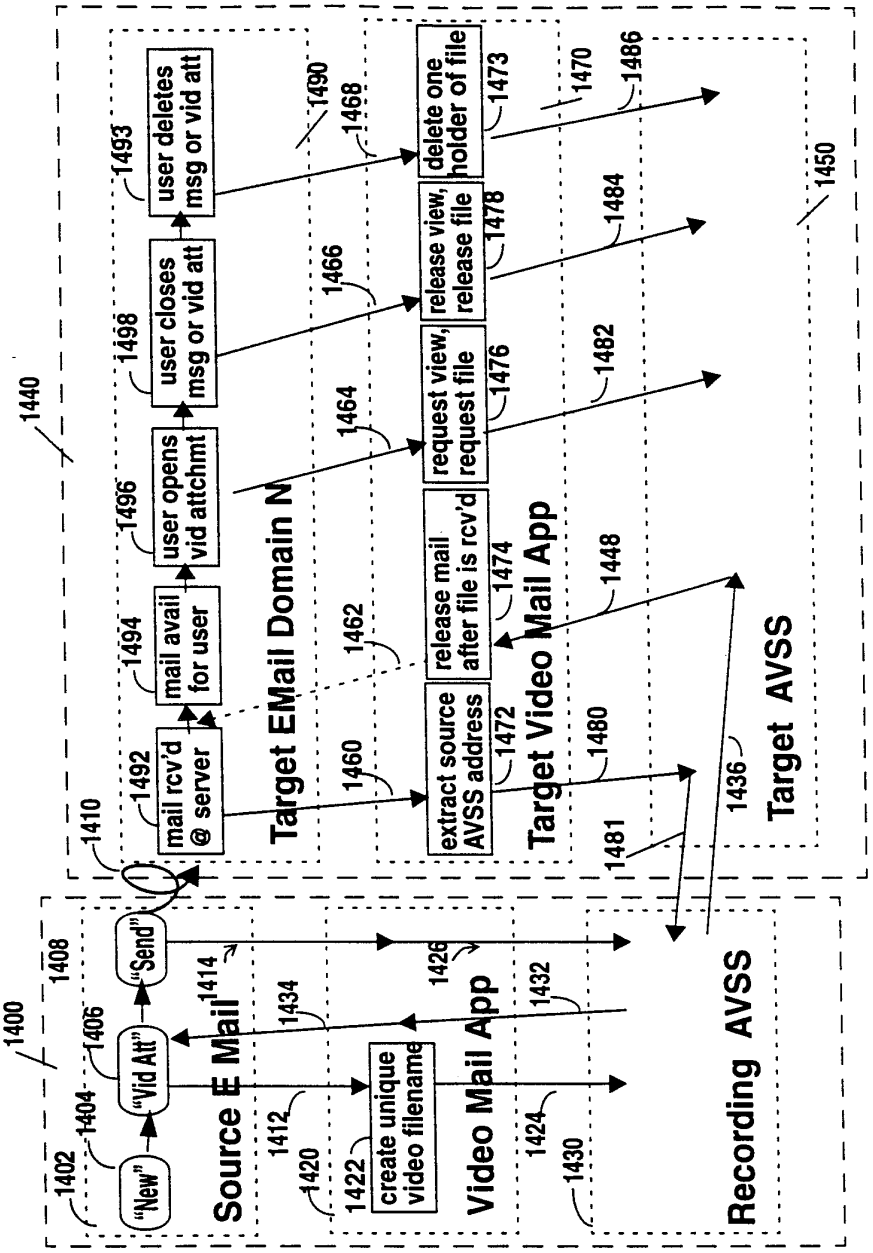

*30/46*

Figure 31



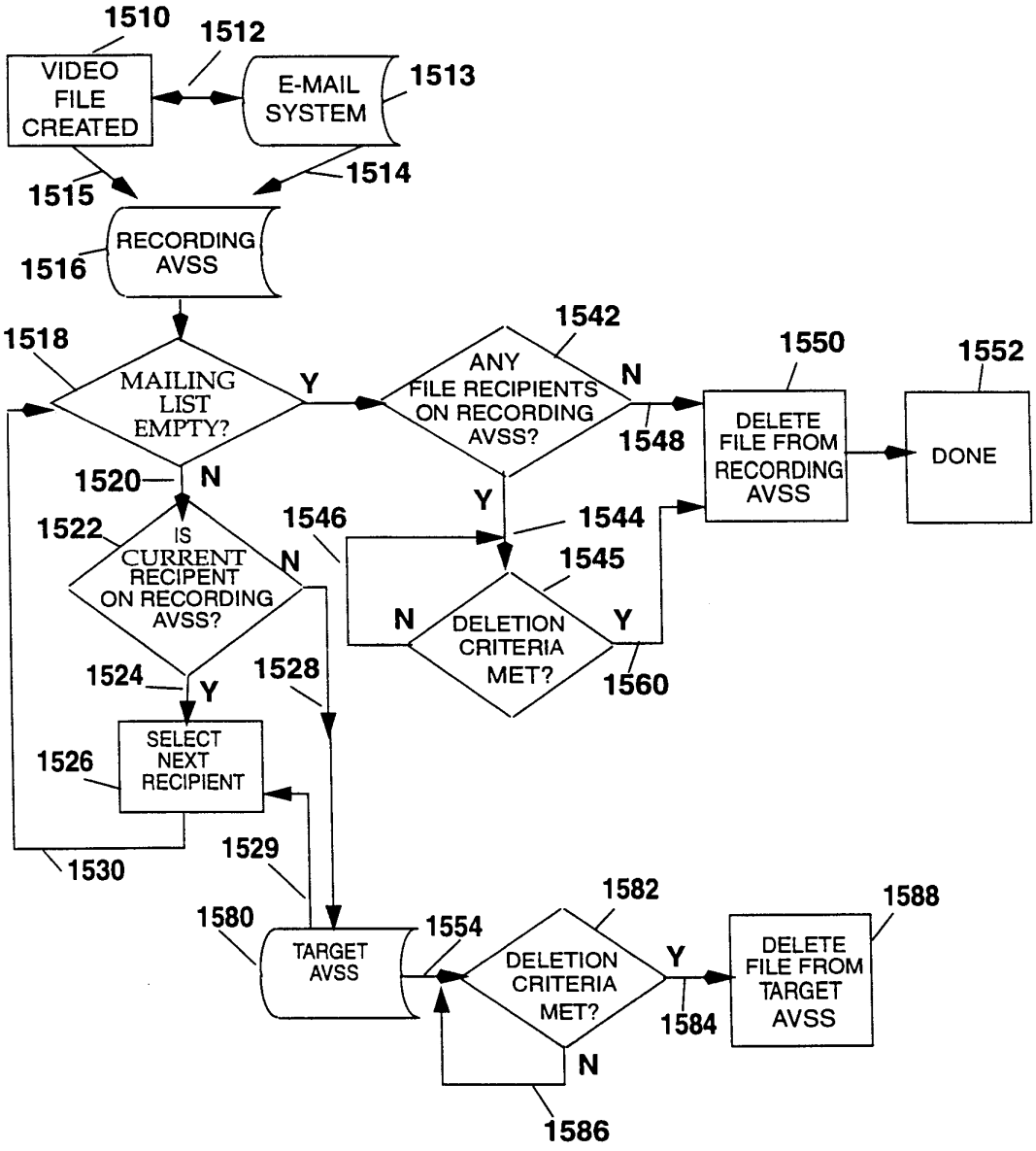

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Figure 32




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Figure 33




*33/46*

Figure 34

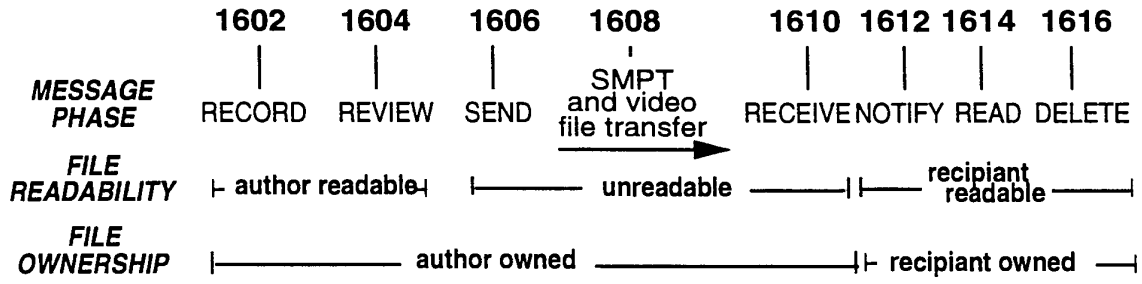

1602
1604
1606
1608
1610
1612
1614
1616
MESSAGE PHASE
RECORD
REVIEW
SEND
SMPT and video file transfer
RECEIVE
NOTIFY
READ
DELETE
FILE READABILITY
author readable
unreadable
recipiant readable
FILE OWNERSHIP
author owned
recipiant owned

Figure 35

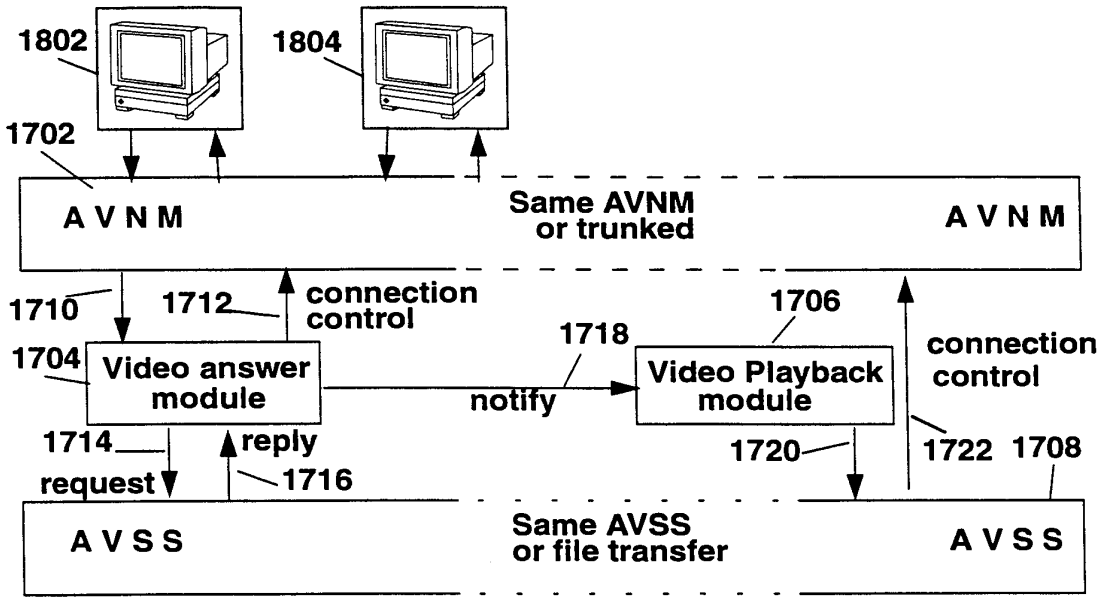
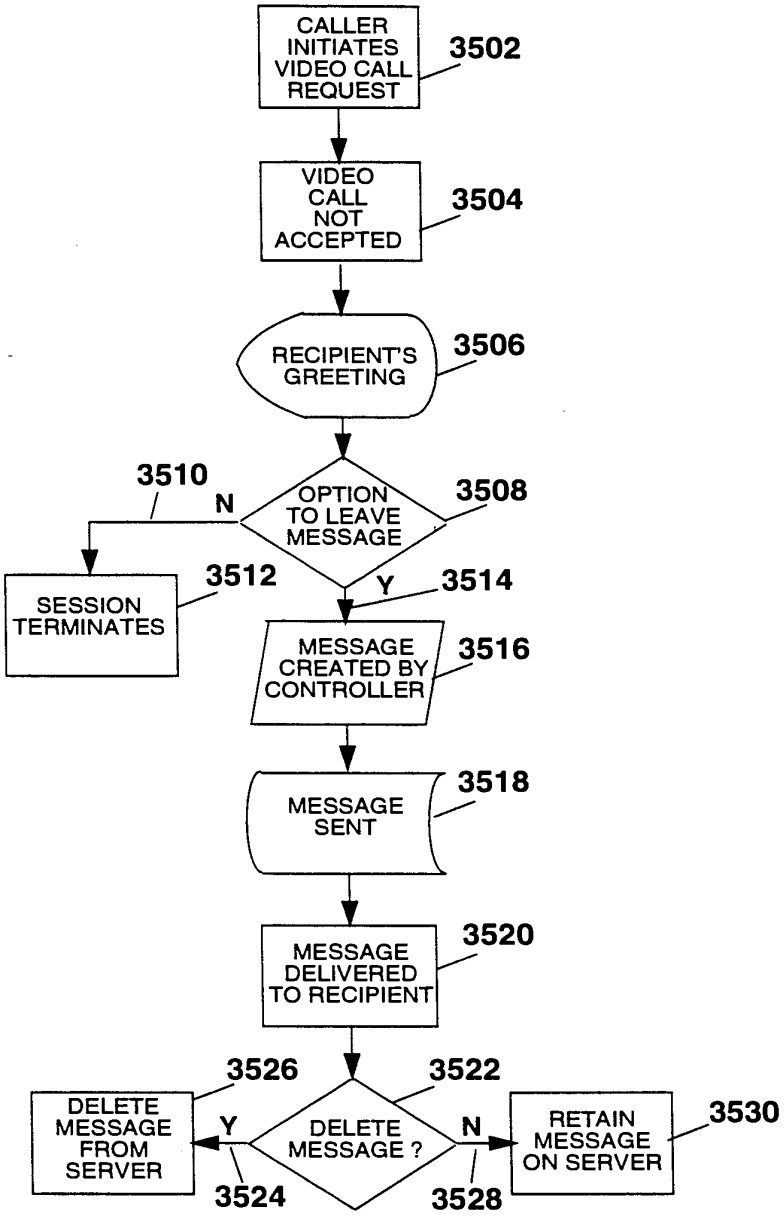

1802
1804
1702
A V N M
Same AVNM
or trunked
A V N M
1710
1712
connection
control
1706
1718
1704
Video answer
module
notify
Video Playback
module
connection
control
1714
reply
1720
1722
1708
request
1716
A V S S
Same AVSS
or file transfer
A V S S

Figure 36




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Figure 37

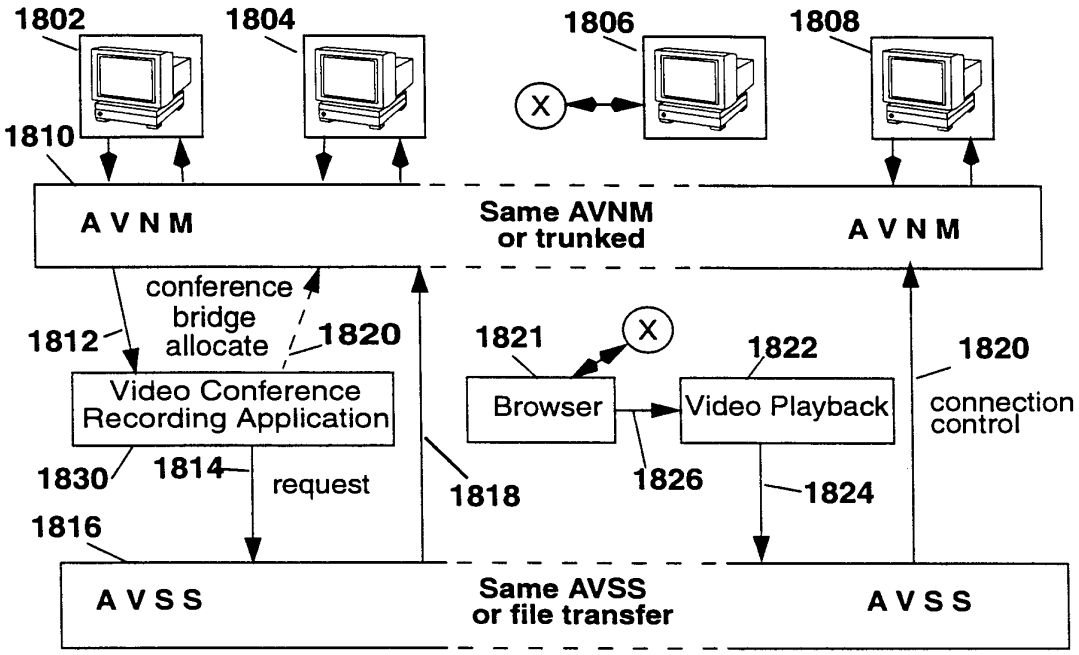
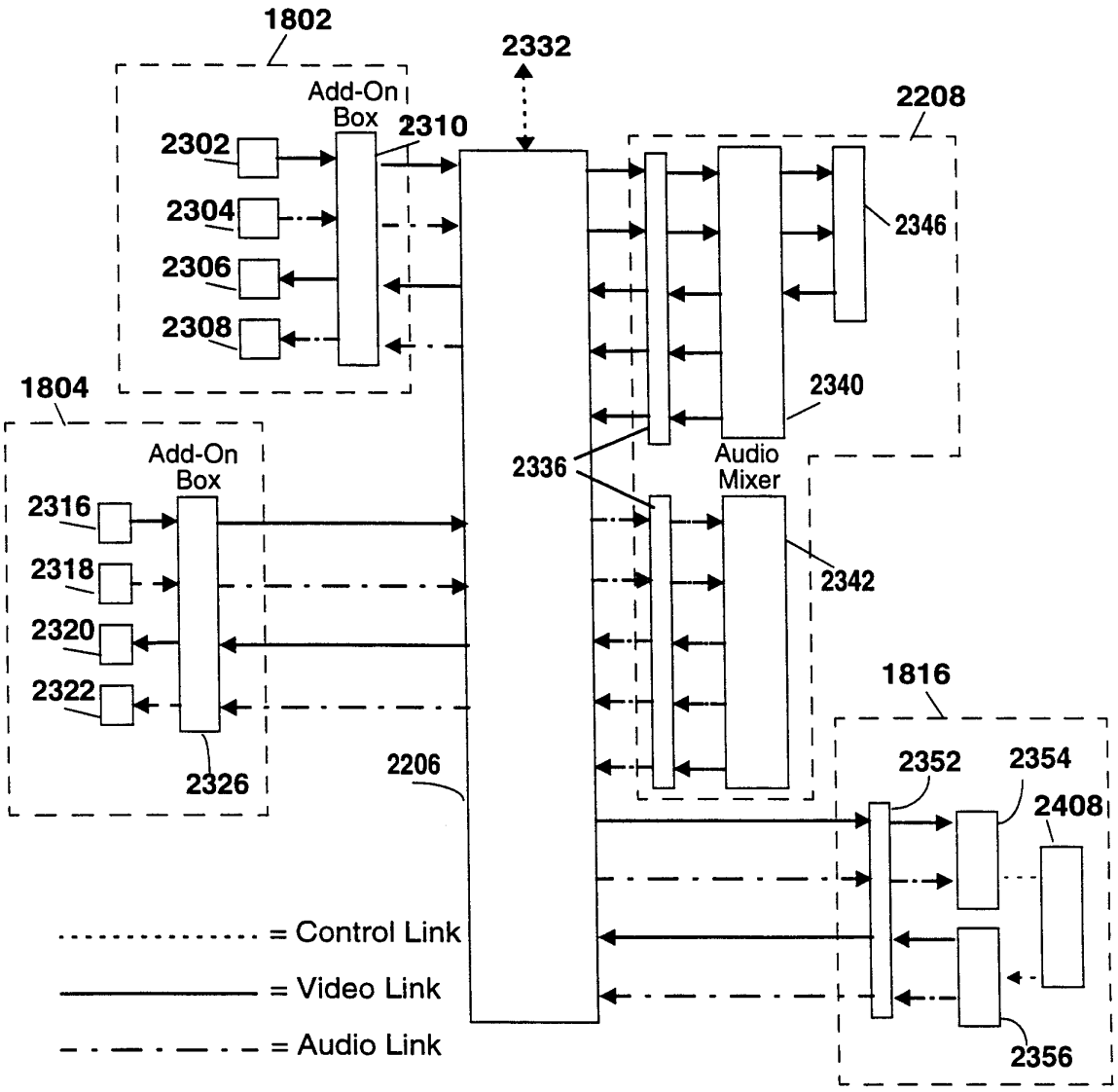
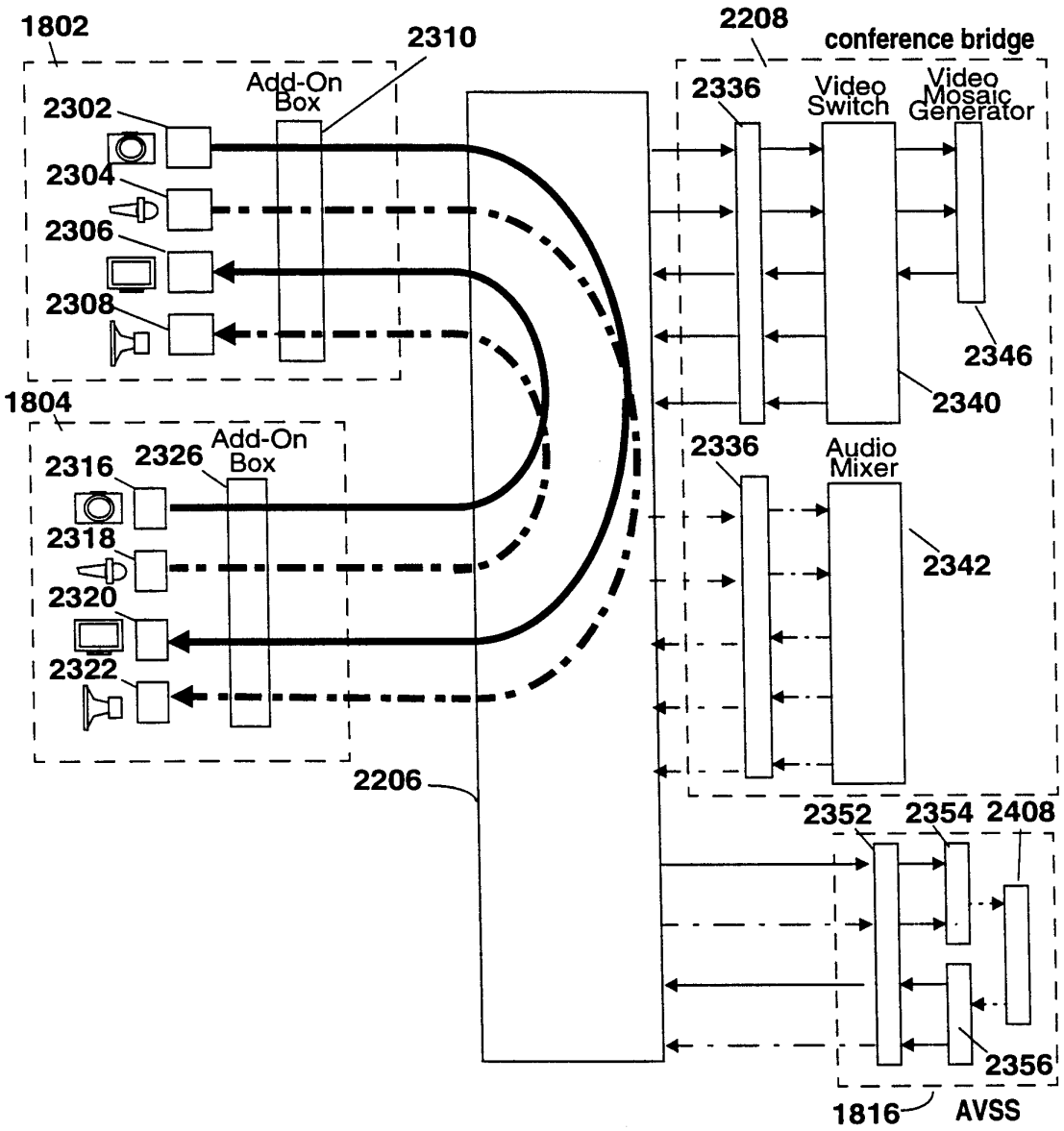

1802
1804
1806
1808
1810
X
A V N M
Same AVNM
or trunked
A V N M
conference
bridge
allocate
1812
1820
1821
X
1822
1820
Video Conference
Recording Application
Browser
Video Playback
connection
control
1830
1814
request
1818
1826
1824
1816
A V S S
Same AVSS
or file transfer
A V S S

Figure 38



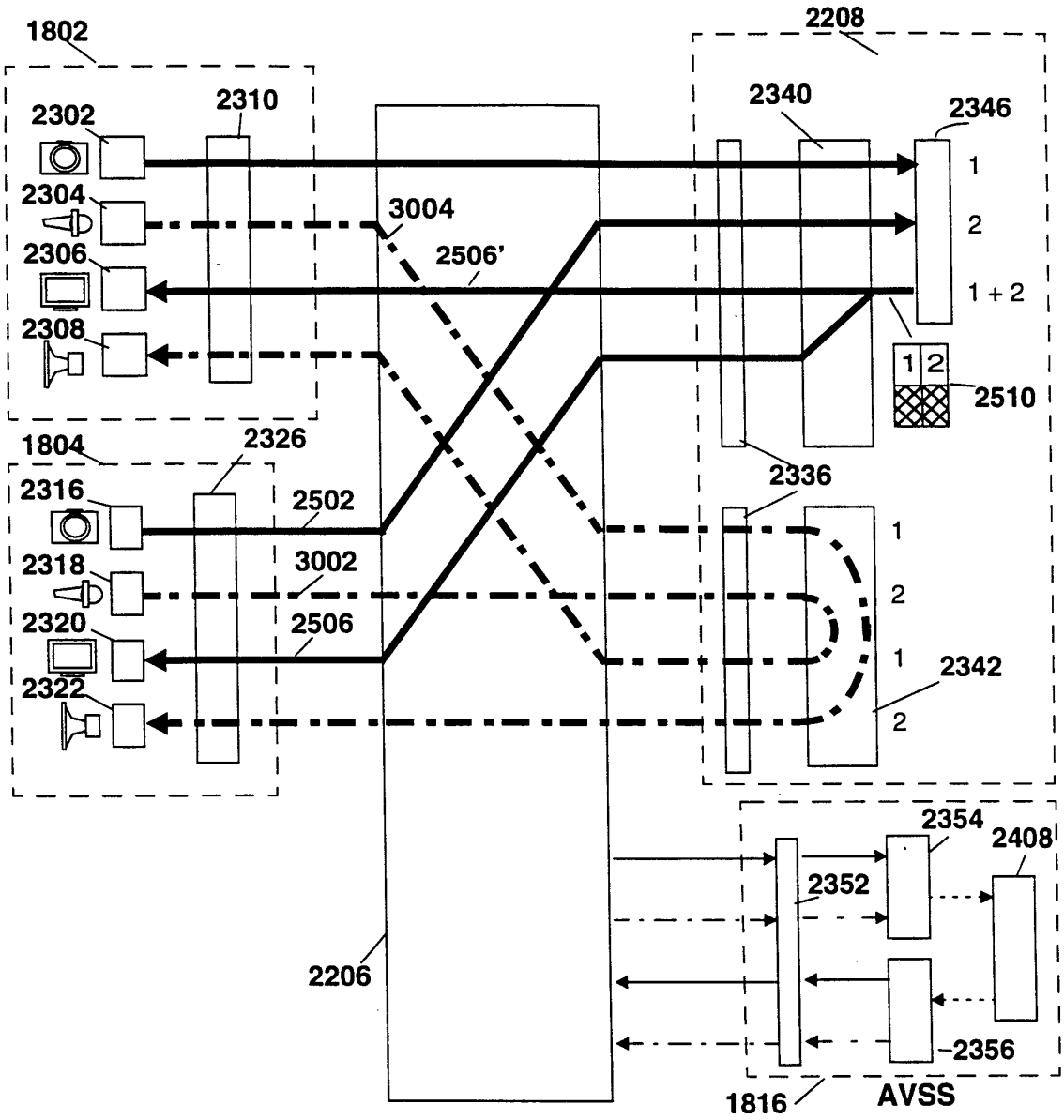

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Figure 39



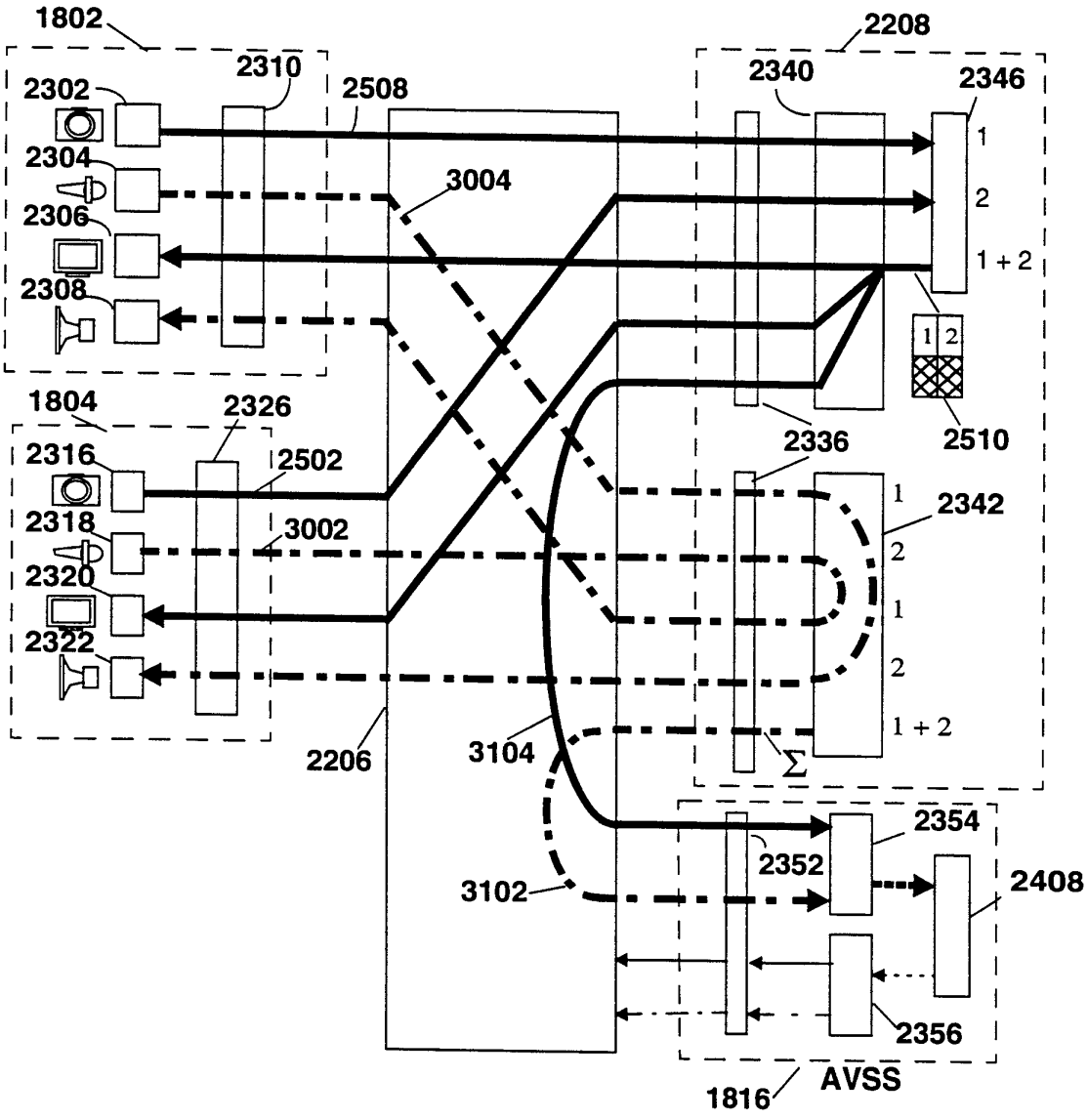

*39/46*

Figure 40



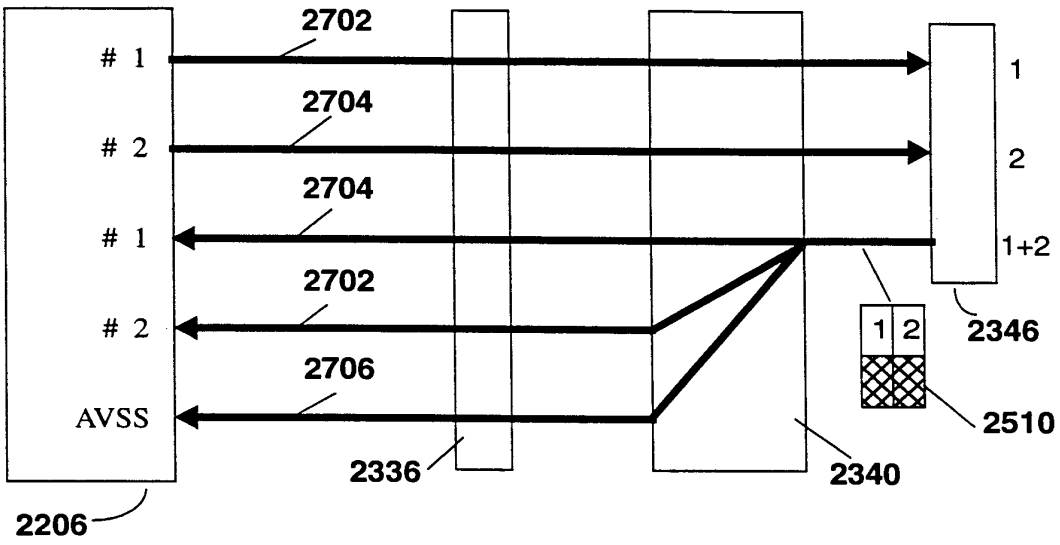

*40/46*

Figure 41



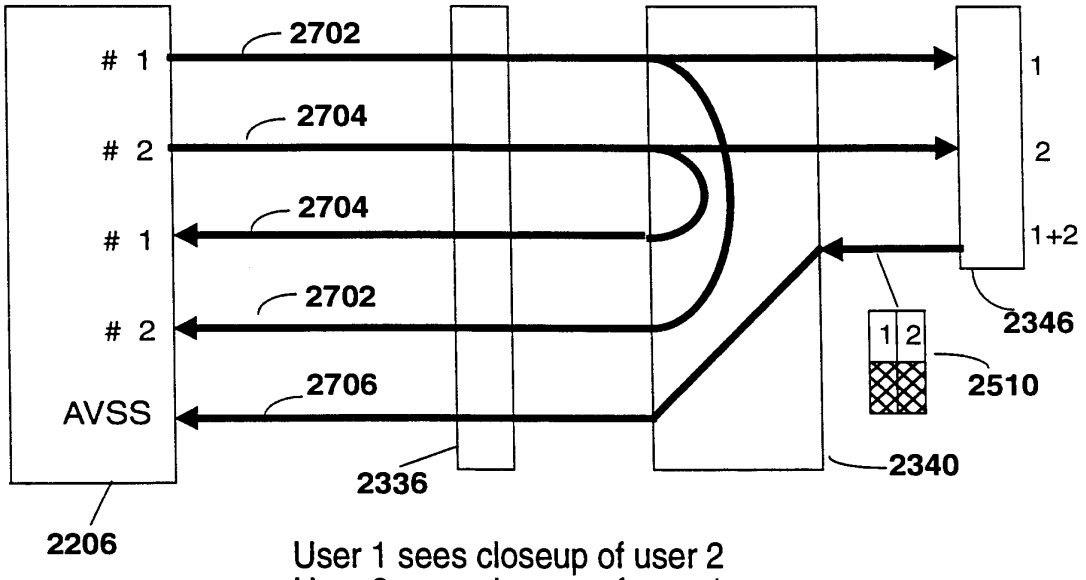

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Figure 42



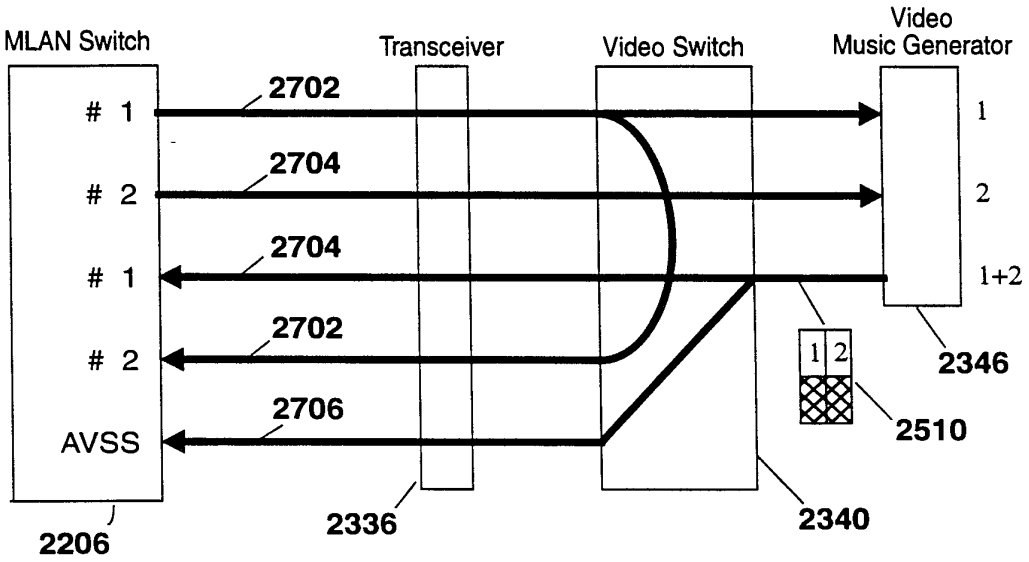

User 1 sees mosaic of users 1 and 2
User 2 sees mosaic of users 1 and 2
AVSS receives mosaic of users 1 and 2

Figure 43




User 1 sees closeup of user 2
User 2 sees closeup of user 1
AVSS receives mosaic of users 1 and 2

**Figure 44**




User 1 sees mosaic of users 1 and 2
User 2 sees closeup of user 1
AVSS receives mosaic of users 1 and 2

Figure 45

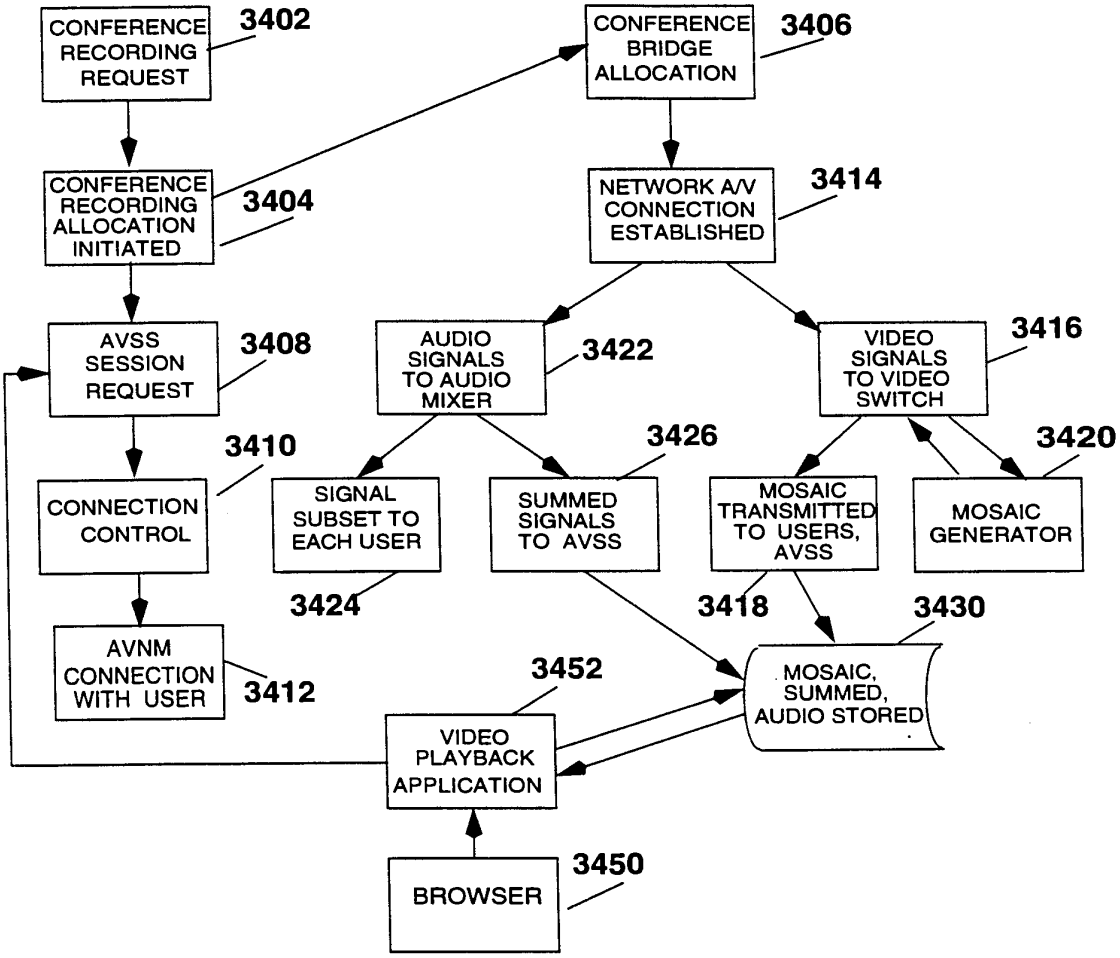
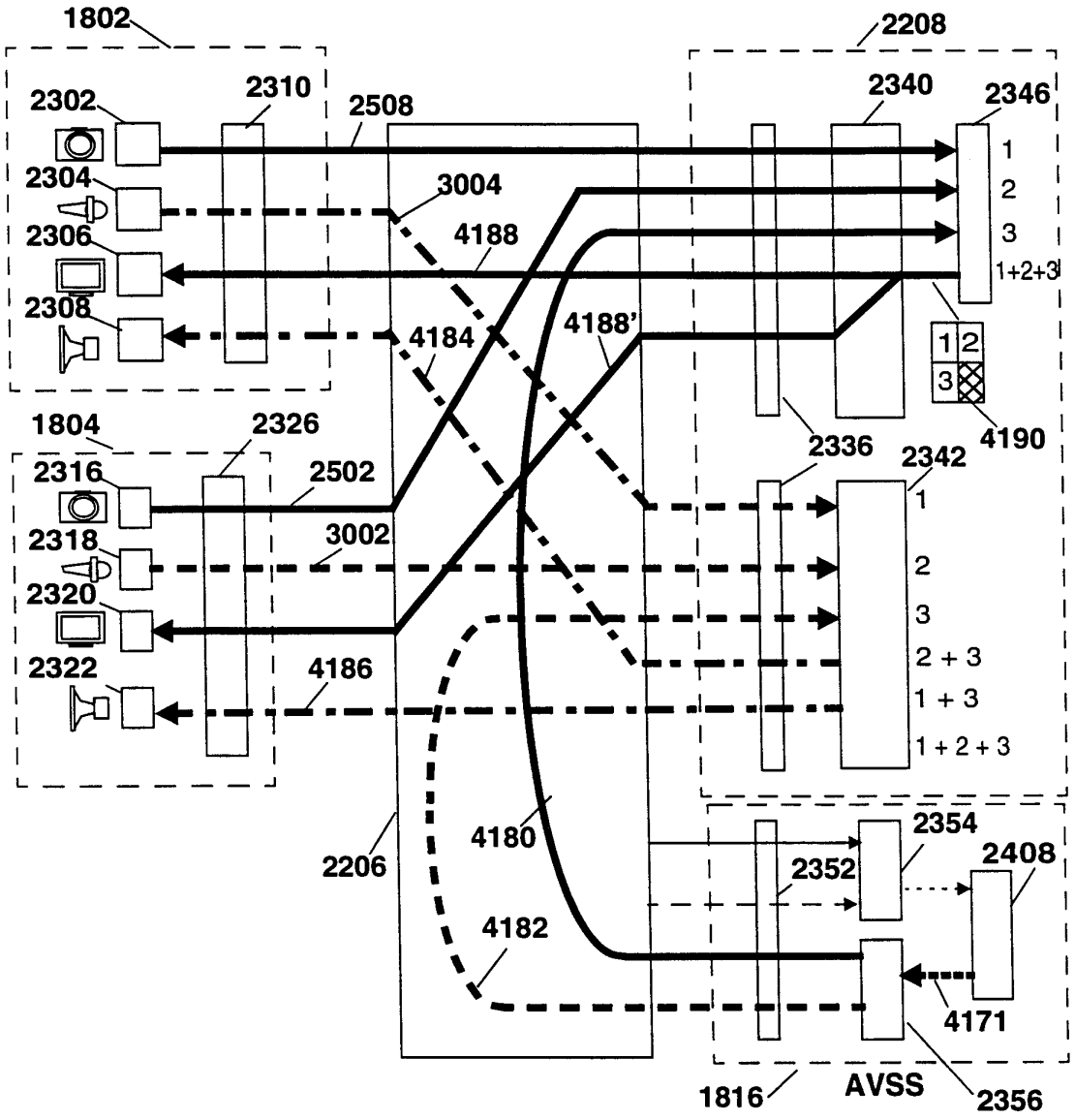

CONFERENCE RECORDING REQUEST
3402
CONFERENCE BRIDGE ALLOCATION
3406
CONFERENCE RECORDING ALLOCATION INITIATED
3404
NETWORK A/V CONNECTION ESTABLISHED
3414
AVSS SESSION REQUEST
3408
AUDIO SIGNALS TO AUDIO MIXER
3422
VIDEO SIGNALS TO VIDEO SWITCH
3416
3410
3426
3420
CONNECTION CONTROL
SIGNAL SUBSET TO EACH USER
SUMMED SIGNALS TO AVSS
MOSAIC TRANSMITTED TO USERS, AVSS
MOSAIC GENERATOR
3424
3418
3430
AVNM CONNECTION WITH USER
3412
3452
MOSAIC, SUMMED, AUDIO STORED
VIDEO PLAYBACK APPLICATION
BROWSER
3450

Figure 46




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# INTERNATIONAL SEARCH REPORT

International application No.
PCT/US98/23596

A. CLASSIFICATION OF SUBJECT MATTER
IPC(6) : G06F 9/46; H04L 12/28, 12/56, 12/40
US CL : 370/432, 440; 395/200.02, 200.49, 800
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. : 370/432, 440; 395/200.02, 200.49, 800

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. |
|---|---|---|
| Y,P | US 5,740,176 A (GUPTA et al) 14 April 1998, abstract. | 1-75 |
| Y | US 5,673,265 A (GUPTA et al) 30 September 1997, abstract | 1-75 |
| Y | US 5,617,539 A (LUDWIG et al) 01 April 1997, abstract | 1-75 |
| Y | US 5,574,934 A (MIRASHRAFT et al) 12 November 1996, see entire document | 1-75 |
| A | US 5712976 A (FALCON, JR et al) 27 January 1998 , abstract | 1-75 |

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

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| "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
03 FEBRUARY 1999

Date of mailing of the international search report
18 MAR 1999

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(72) Inventor; and

(75) Inventor/Applicant *(for US only)*: **MACOURS, Christophe, M.** [BE/NL]; c/o Prof. Holstlaan 6, NL-5656 AA Eindhoven (NL).

(74) Agents: **GROENENDAAL, Antonius, W., M.** et al.; Prof. Holstlaan 6, NL-5656 AA Eindhoven (NL).

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**Declaration under Rule 4.17:**

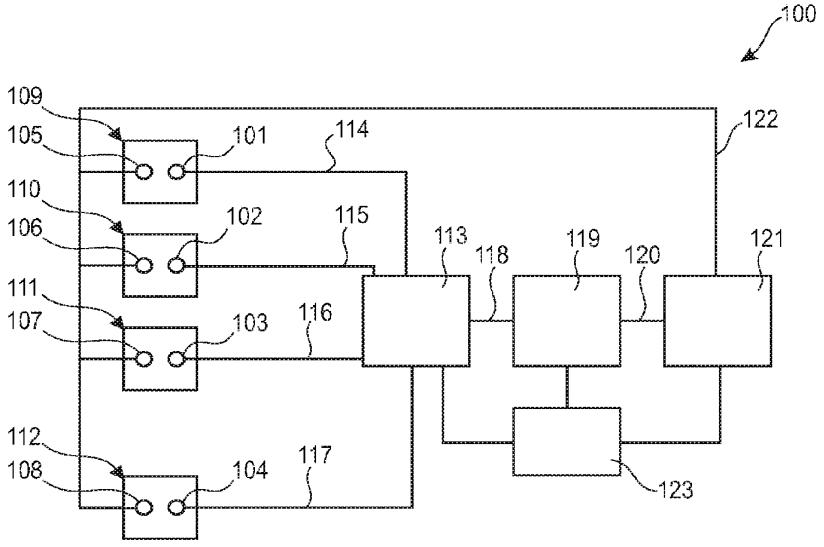
— *as to applicant's entitlement to apply for and be granted a patent (Rule 4.17(ii))*

**Published:**

— *without international search report and to be republished upon receipt of that report*

*For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.*

(54) Title: A DEVICE FOR AND A METHOD OF PROCESSING AUDIO DATA




(57) Abstract: A device (100) for processing audio data, wherein the device (100) comprises a plurality of microphones (101 to 104) each adapted to detect audio data (114 to 117), a plurality of speakers (105 to 108) each adapted to emit acoustic waves and each equipped with an assigned one of the plurality of microphones (101 to 104), a calculation unit (113) adapted to calculate acoustical transfer functions (118) between the plurality of speakers (105 to 108) based on the audio data (114 to 117) detected by the plurality of microphones (101 to 104), and a determining unit (119) adapted to determine orientation information (120) indicative of the relative orientation of the plurality of speakers (105 to 108) based on the calculated acoustical transfer functions (120).

WO 2007/135581 A2

# A device for and a method of processing audio data

## FIELD OF THE INVENTION

The invention relates to a device for processing audio data.

Beyond this, the invention relates to a method of processing audio data.

Moreover, the invention relates to a program element.

Furthermore, the invention relates to a computer-readable medium.

## BACKGROUND OF THE INVENTION

Audio playback devices become more and more important. Particularly, an increasing number of users buy audio surround systems comprising multiple loudspeakers.

US 2005/0254662 A1 discloses automatic calibration of an acoustic system. The acoustic system may include a source A/V device, calibration computing device, and multiple rendering devices. The calibration system may include a calibration component attached to each rendering device and a source calibration module. The calibration component on each rendering device includes a microphone. The source calibration module includes distance and optional angle calculation tools for automatically determining a distance between the rendering device and a specified reference point upon return of the test signal from the calibration component.

WO 2005/076912 A2 discloses a network including an audio signal producing device, a content distributor communicatively coupled to the audio signal producing device, a router, a network communication medium communicatively coupling the content distributor and the router, and a plurality of addressable loudspeakers communicatively coupled to the network communication medium, wherein each of the addressable loudspeakers are configured to function as a network peripheral in the home network.

However, conventional audio systems comprising multiple loudspeakers may be difficult to install, since many consumers are not familiar with the mounting of complex audio systems.

## OBJECT AND SUMMARY OF THE INVENTION

It is an object of the invention to provide a user-friendly audio system.

In order to achieve the object defined above, a device for processing audio data, a method of processing audio data, a program element and a computer-readable medium according to the independent claims are provided.

According to an exemplary embodiment of the invention, a device for processing audio data is provided, wherein the device comprises at least one microphone (particularly a plurality of microphones) each adapted to detect audio data, a plurality of speakers each adapted to emit acoustic waves, wherein at least a part of (for instance each of) the plurality of speakers is provided (particularly equipped) with an assigned one of the at least one microphone, a calculation unit adapted to calculate acoustical transfer functions between the plurality of speakers based on the audio data detected by the at least one microphone, and a determining unit adapted to determine orientation information indicative of the relative orientation of the plurality of speakers based on the calculated acoustical transfer functions.

According to another exemplary embodiment of the invention, a method of processing audio data is provided, wherein the method comprises detecting audio data using at least one microphone (particularly a plurality of microphones), emitting acoustic waves using a plurality of speakers, wherein at least a part of (for instance each of) the plurality of speakers is provided (particularly equipped with an assigned one of the at least one microphone, calculating acoustical transfer functions between the plurality of speakers based on the audio data detected by the at least one microphone, and determining orientation information indicative of the relative orientation of the plurality of speakers based on the calculated acoustical transfer functions.

According to yet another exemplary embodiment of the invention, a computer-readable medium is provided, in which a computer program of processing audio data is stored which, when being executed by a processor, is adapted to control or carry out a method having the above mentioned features.

According to still another exemplary embodiment of the invention, a program element of processing audio data is provided, which program element, when being executed by a processor, is adapted to control or carry out a method having the above mentioned features.

Data processing for orientation estimation purposes which may be performed according to embodiments of the invention can be realized by a computer program, that is by software, or by using one or more special electronic optimization circuits, that is in hardware, or in hybrid form, that is by means of software components and hardware components.

According to an exemplary embodiment of the invention, an audio processing and/or playback system may be provided in which a configuration of a plurality of speakers (for instance loudspeakers or other reproduction apparatuses) may be determined automatically based on an evaluation of the audio emission and audio absorption properties of the speakers and assigned microphones. If necessary, the configuration of the speakers may be adjusted (for instance electronically and/or mechanically) so as to improve the audio playback performance of the multi-speaker apparatus.

In a system like an audio surround system in which a plurality of loudspeakers have to be mounted and adjusted, it may be difficult for a user to configure this system in an optimum manner with regard to loudspeaker position and orientation, since a user is in many cases not an expert. In accordance with an exemplary embodiment of the invention, when a user has installed such a system, each loudspeaker may emit (sequentially or simultaneously with the other loudspeakers) an audio signal (for instance a normal useful audio data signal or a signal specifically adapted for configuring) which may be detected by the microphones assigned (particularly located directly next to) to the other loudspeakers. By taking this measure, the acoustical transfer functions of the loudspeaker/microphone systems may be detected in a pair wise manner.

By evaluating this information, it is possible to calculate back the relative orientations and/or relative positions of the loudspeakers. With this information, the system may then adjust the playback characteristics of the speakers so as to improve the audio performance. This may include adjusting parameters like audio amplitude, frequency distribution, filter characteristics, addition of special effects like reverberation, etc. It may also include modifying the geometrical arrangement of the loudspeakers, for instance changing the spatial orientation of the loudspeakers (for instance using an electromotor installed in each of the loudspeakers). By taking these measures, the audio playback quality may be improved particularly at a special spatial area or point (which may be user-defined or which may be the position at which a listener is currently located or which can be a center of gravity of the loudspeakers). Thus, a user-friendly system may be provided which allows to automatically configuring the loudspeaker system in an appropriate manner even in a scenario in which a user has installed the loudspeakers in an incorrect manner.

Embodiments of the invention may take into account orientation properties of loudspeakers (having, in reality, directivity instead of being purely omni-directional). Thus, improper orientation may be compensated and it may thus be ensured that the loudspeaker points into the direction of a listener. Particularly, by considering transfer functions of an

audio system, a frequency-amplitude characteristic may be taken into account for correcting the audio system properties.

It is possible to equip each of the speakers with an assigned microphone. Alternatively, it is possible to equip only a part of the speakers (for instance a single one or a group of the speakers) with an assigned microphone.

According to an exemplary embodiment, automatic loudspeaker orientation correction may be provided. In such an embodiment, a surround sound system may be provided comprising at least two loudspeakers, each equipped with a (closely positioned) microphone. The surround sound system may further comprise a unit for measuring acoustical transfer functions between all speakers. A unit for determining the orientation of the speakers based on the transfer functions may be foreseen. According to an exemplary embodiment, an audio signal to be rendered by the speakers may be corrected based on the orientation information.

Thus, exemplary embodiments of the invention may not only have the capability that loudspeakers equipped with a microphone can automatically provide loudspeaker and/or room acoustics correction, but also the orientation of the loudspeakers may be taken into account. In other words, exemplary embodiments of the invention do not have to assume the loudspeaker to be omni-directional and may provide specific means to correct its (possibly) wrong orientation with respect to a listening position. According to an exemplary embodiment, automatic acoustic compensation in surround sound systems may be made possible.

According to an exemplary embodiment, a method for automatically correcting a wrong orientation of the loudspeakers in a home theatre (for instance in a 5.1 system, denoting a stereo format utilizing three primary channels (left, center, right), two surround channels (left surround, right surround) and an LFE channel, which is the ".1" channel because it uses approximately one-tenth of the bandwidth of a full-frequency channel) system based on the normalization of high frequency energy level contained in cross loudspeaker transfer functions may be made possible.

One aspect of home theatre systems is the loudspeaker setup and its calibration to the listener position. Quite often, it may happen that some loudspeakers are not properly connected (for instance polarity inversion, left/right inversion, etc.), and sometimes even not unpacked at all. According to an exemplary embodiment of the invention, an automated home theatre calibration system may be provided to improve a configuration of a loudspeaker setup, particularly with regard to orientation.

It may be advantageous that automatic home theatre calibration systems have a room correction feature. An issue is to compensate the acoustics of the loudspeakers in the listening room in order to get an improved or optimal ("flat") response at the listening position. To achieve this, it is conventionally possible to place a microphone at the listener position. Possible corrections with a microphone at the listener positions are:

level correction: compensation of the level (amplitude) differences between the different loudspeakers

delay correction: ensures all loudspeaker signals arrive simultaneously at the listener position

low frequency room acoustics correction: compensation of low frequency loudspeaker response and of the room (anti-)resonances and modes

high frequency room acoustics correction: compensation of the high frequency loudspeaker response, of the room response and of the wrong orientation of the loudspeaker boxes.

However, from a user perspective, merely placing a specific accessory (for instance a microphone) at the listener position during the calibration procedure is not user-friendly, particularly in terms of "Sense and Simplicity".

Therefore, exemplary embodiments of the invention are based on the recognition that the following reasoning holds: what parts of the possible improvements listed above would be possible if each loudspeaker box would be equipped with one microphone, without having a microphone at the listener position. Actually, it is not only possible to compute the geometrical configuration of the loudspeakers (by means of delay calculations). But it is also desirable to compensate for the wrong orientation of the loudspeaker boxes and simultaneously perform a high frequency room acoustics correction.

According to an exemplary embodiment of the invention, a system for automatically correcting a possibly wrong orientation of two, three, four, five, six, seven or more loudspeakers in a home theatre (for instance in a 5.1) system may be made possible by normalizing particularly high frequency energy level contained in the loudspeaker transfer functions. The transfer function having the most energy at high frequencies may be considered as a reference.

The term "transfer function" may describe the transfer characteristics of a system or equipment. It may relate to the relationship between an input and an output of the system or equipment in terms of the transfer characteristics. The term "acoustical transfer function" between loudspeakers/microphones may relate to properties of an acoustical

transfer in an acoustic field between the loudspeakers (including the microphones connected thereto), determinable on the basis of electric signals derived from the detection of acoustical audio signals. The transfer function may relate to the process by which an audio source wave passes through the space and is detected elsewhere. More particularly, a transfer function may be indicative of the transformation encountered by sound when passing from a source (like a loudspeaker) to a destination (like a microphone or a listener). The transfer function may be amplitude versus frequency curve indicative of the sound characteristic of the audio system. For instance, when a "white" audio signal is emitted by a loudspeaker and detected by a microphone, the characteristic of the loudspeaker-microphone system may transfer the white audio signal into a frequency-amplitude curve. In an audio system comprising two microphones ands two loudspeakers, four transfer functions may be measured (microphone 1-loudspeaker 1, microphone 1-loudspeaker 2, microphone 2-loudspeaker 1, microphone 2-loudspeaker 2).

In the following, some aspects concerning loudspeaker directivity of exemplary embodiments of the invention will be explained.

A loudspeaker box has a frequency dependent directivity characteristic. At low frequencies, a loudspeaker driver may act as a pure piston and the radiated sound field may be omni-directional. At high frequencies, the loudspeaker becomes more directive because the loudspeaker driver diameter becomes large relative to the wavelength. Therefore, a bad loudspeaker orientation can strongly effect the reproduction particularly of high frequencies.

Moreover, another aspect of bad loudspeaker orientation in a listening room is that if a loudspeaker box is pointing towards the wall, the wall may reflect a significant amount of energy back to the listening area. Because walls have a rather absorbent behavior, these reflected waves will also experience a low pass filtering that will also affect the overall frequency balance.

Exemplary fields of application of the embodiments of the invention are sound reproduction systems equipped with multiple (for instance at least two) loudspeakers, such as stereo (for instance portable) systems, and home theatre systems (for instance 5.1, 7.1, etc.).

Next, further exemplary embodiments of the invention will be explained. In the following, further exemplary embodiments of the device for processing audio data will be explained. However, these embodiments also apply for the method, for the computer-readable medium and for the program element.

The calculation unit may be adapted to calculate acoustical transfer functions between each pair of the plurality of speakers based on the audio data detected by the

plurality of microphones. In such a scenario, at one time, one of the loudspeakers may emit an acoustical (test) signal, which acoustical (test) signal may be detected by all microphones assigned to the other loudspeakers. Transfer functions may be derived from this information. After this, the next loudspeaker may emit an audio signal and the microphones assigned to the remaining loudspeakers detect the corresponding audio signals. By taking this measure, all loudspeakers serve sequentially as an audio source and the microphones detect the corresponding audio signals as a basis for deriving the acoustical transfer functions. This procedure allows deriving all information necessary to analyze the systems. If desired, correction instructions may be provided so as to correct the orientation or acoustical emission properties of the loudspeakers.

The determining unit may be adapted to determine the orientation information indicative of the spatial positions and/or of the audio emission direction of the plurality of speakers. From the calculated acoustical transfer functions, applying basic mathematical procedures, the orientations and positions of the loudspeakers may be determined (for instance by evaluating intensities, applying damping models, analyzing delays, analyzing correlations between different signals, evaluating frequency information, considering directivity characteristics, evaluating propagation times in combination with propagation velocities, etc.). This orientation and position information may serve as a basis for correcting the setup of the speakers.

At least a part of the plurality of speakers and the assigned one of the plurality of the microphones may be accommodated in a separate casing. In other words, a plurality of modules or separate entities may be provided, wherein each microphone and the corresponding loudspeaker may be provided in a separate housing. This may allow for a spatially distributed audio configuration and therefore a high quality audio performance.

A correction unit may be provided and may be adapted to correct an audio playback characteristic of at least a part of the plurality of speakers based on the determined orientation information. Therefore, after having analyzed the proper audio emission properties of the speakers, the correction unit may adjust the audio playback characteristics of the speakers so as to improve the audio performance. For instance, the audio playback characteristics may be improved or even optimized for a predetermined listening position. This listening position may be a user-defined position (for instance defined by a user of the sound system via an user interface), a geometrical center of the plurality of speakers (which may be calculated based on the knowledge at which positions the loudspeakers are positioned), or a position defined with respect to a given component of an audio system (for

instance improving the sound quality in front of a television where a user is usually sitting when using the sound system).

The adjusted audio playback characteristic may comprise an amplitude of the audio playback of an individual one of the speakers, of a part of the speakers or of all speakers, a frequency filtering characteristics (for instance the definition of cut-off frequencies or frequency bands), and an equalizer characteristic. These are only examples and may be substituted by or combined with any other audio playback characteristics.

The device may further comprise a correction unit that is adapted to correct the orientation of at least a part of the plurality of speakers based on the determined orientation information. In other words, the speakers may also be provided to be movable (for instance adapted for a translational movement and/or for a rotational movement). For this purpose, an electric motor may be provided, or the devices may simply be foreseen to be movable by a user. In the latter case, the user may be provided or guided by the device with an instruction as to how to modify a position and/or an orientation of one of the speakers to improve playback quality.

The calculation unit may be adapted to calculate the acoustical transfer functions between the plurality of speakers based on components of the audio data which components exceed a predetermined frequency threshold (of, for instance, several kHz). For instance, high frequencies may be particularly suitable to be analyzed in accordance with exemplary embodiments of the invention, since directivity of a loudspeaker is usually higher at high frequencies than at low frequencies. In other words, a loudspeaker is essentially omni-directional at low frequencies and shows directional behavior at high frequencies. Therefore, an evaluation in the high frequency domain may derive more meaningful results with regard to orientation. Such a frequency threshold or transition frequency may be in the range of 500 Hz to 20 kHz, particularly in the range of 1 kHz to 5 kHz, more particularly in the range of 2 kHz to 4 kHz. Thus, specifically such a high frequency range may be subject of the investigations. Although the given exemplary numbers for the transition frequency may be valid for many loudspeakers, it should be kept in mind that this frequency value, at which a transition between an omni-directional behavior and a directive behavior occurs, is usually smaller, the larger the loudspeaker is. More generally, the value may be dependent on the size of the loudspeaker and consequently dependent on the size of an acoustical cone emitted by the loudspeaker.

In the following, the technical definition of the so-called "piston range of a cone loudspeaker" will be given. The piston range, where a loudspeaker cone is considered as being omni-directional, is technically defined by:

$$k\,a < 1$$

where “k” is the wave number and “a” the loudspeaker cone radium in meters. For $k\,a > 1$, the loudspeaker cone starts to be more and more directional as frequency increases.

Furthermore, the way the loudspeaker is mounted may have an influence on the frequency value.

At least a part of the plurality of microphones may be omni-directional microphones. The term omni-directional may relate to a not directional component. It may denote receiving sound waves in or from any direction, particularly so-called 360° receiving capability.

The device for processing audio data may be realized as at least one of the group consisting of an audio surround system, a stereo audio system, a mobile phone, a headset, a hearing aid, a hands free system, a television device, a video recorder, a monitor, a gaming device, a laptop, an audio player, a DVD player, a CD player, a hard disk-based media player, an internet radio device, a public entertainment device, a portable audio player, an MP3 player, a hi-fi system, a vehicle entertainment device, a car entertainment device, a medical communication system, a body-worn device, a speech communication device, a home cinema system, and a music hall system.

However, although the system according to an embodiment of the invention primarily intends to improve the quality of sound or audio data, it is also possible to apply the system for a combination of audio data and visual data. For instance, an embodiment of the invention may be implemented in audiovisual applications like a portable video player in which multiple speakers are used.

It is further possible to use, instead of a single microphone assigned to each speaker, a plurality of microphones assigned to a particular speaker. By averaging the signals captured by the plurality of microphones assigned to a particular speaker, it is possible, with improved accuracy, to derive information to compensate for inaccurate speaker orientation. The aspects defined above and further aspects of the invention are apparent from the examples of embodiment to be described hereinafter and are explained with reference to these examples of embodiment.

BRIEF DESCRIPTION OF THE DRAWINGS

The invention will be described in more detail hereinafter with reference to examples of embodiment but to which the invention is not limited.

Fig. 1 shows an audio processing system according to an exemplary embodiment of the invention.

Figs. 2A and 2B shows an audio playback system in two different configurations according to exemplary embodiments of the invention.

Figs. 3A and 3B illustrates a method of calibrating an audio processing system according to an exemplary embodiment of the invention.

Fig. 4 shows a flow diagram illustrating a method of processing audio data according to an exemplary embodiment of the invention.

DESCRIPTION OF EMBODIMENTS

The illustration in the drawing is schematically. In different drawings, similar or identical elements are provided with the same reference signs.

In the following, referring to Fig. 1, an audio processing system 100 according to an exemplary embodiment of the invention will be explained.

The audio processing system 100 comprises a first microphone 101, a second microphone 102, a third microphone 103 and a fourth microphone 104. The number of microphones may be larger or smaller than four, particularly may be larger than or equal to two. Each of the microphones 101 to 104 is adapted to detect audio data emitted by anyone of a plurality of loudspeakers, namely a first loudspeaker 105, a second loudspeaker 106, a third loudspeaker 107 and a fourth loudspeaker 108.

As can be taken from Fig. 1, a first housing 109 is provided in which the first microphone 101 and the first loudspeaker 105 are accommodated or integrated. The second microphone 102 and the second loudspeaker 106 are embedded in a second housing 110. The third microphone 103 and the third loudspeaker 107 are provided within a third housing 111. A fourth housing 112 accommodates the fourth microphone 104 and the fourth speaker 108. Therefore, each of the microphones 101 to 104 has an assigned speaker 105 to 108, and these pairs are located directly neighbored or adjacent to one another. The loudspeakers 105 to 108 are each adapted to emit acoustic waves and are each equipped with the corresponding microphone 101 to 104.

In normal use, the audio system 100 is used for reproducing audio content and may serve as an audio surround system. However, the system 100 also has an automatic loudspeaker orientation configuration feature that will be explained in the following in more detail. With respect to the actual audio playback functionality of a surround system, no further details will be explained in the following.

As can be taken from Fig. 1, each of the microphones 101 to 104 is electrically coupled to a calculation unit 113 so as to provide detected audio data 114 to 117 to the calculation unit 113. The calculation unit 113 is adapted to calculate acoustical transfer functions between the plurality of speakers 105 to 108 based on the audio data 114 to 117 detected by the plurality of microphones 101 to 104.

For example, in a first operation state, only the first loudspeaker 105 emits audio data and the microphones 102 to 104 detect the corresponding audio signals 115 to 117. Then, the second speaker 106 emits an audio signal which is detected by the microphones 101, 103, 104, and so on. From the corresponding data that are detected by the microphones 101 to 104, the calculation unit 113 may calculate all acoustical transfer functions indicative of the acoustical properties of the system and indicative of the present orientation of the speakers 105 to 108 with respect to one another.

The determined acoustical transfer functions 118 are supplied to a determining unit 119 adapted to determine orientation information indicative of the relative orientation of the plurality of speakers 105 to 108 based on the calculated acoustical transfer functions 118. Therefore, the determining unit 119 determines the orientation (that is to say the spatial positions and/or the directions) of the speakers 105 to 108 so as to determine whether there is a need to modify the configuration of the loudspeakers arrangement to improve playback quality.

Corresponding orientation information 120 may be supplied to a correction unit 121 adapted to correct an audio playback characteristic of one or more of the loudspeakers 105 to 108 based on the determined orientation information 120. For this purpose, control signals 122 can, if needed, be provided to the corresponding loudspeakers 105 to 108 to improve the audio performance.

Particularly, the correction unit 121 may calculate the control parameters 122 in such a manner that an audio quality is improved at a predetermined listening position (for instance a position at which a listener is presently or usually located). A user may input such a position to the system 100 via a user interface device 123. Such an I/O device may include a graphical user interface (GUI) having an LCD, a plasma device, or a cathode ray tube.

Furthermore, input elements can be provided at the user interface 123 like a keypad, a joystick, buttons, a trackball, or even a microphone of a voice recognition system.

The control parameters 122 may alter amplitude of any signal to be reproduced by one of the loudspeakers 105 to 108, or may alter a frequency behavior, or may alter equalizer characteristics, or a spatial position of the microphones 105 to 108. Therefore, if needed, one or more of the loudspeakers 105 to 108 may be mechanically turned or shifted.

In the following, referring to Fig. 2 and Fig. 3, further aspects of an exemplary embodiment of the invention will be explained.

Fig. 2 shows a typical home theatre system setup in an ideal configuration 200 and in a non-ideal configuration 250.

Loudspeakers 105 to 108 are shown which are distributed around a human listener 201. Furthermore, a television 202 is shown which may also comprise one or more loudspeakers, wherein such a "center speaker" is assumed to be at the same position as the TV 202.

In the "ideal" configuration 200 as shown in Fig. 2A, all loudspeaker boxes 105 to 108 point towards the listener 201. But in many cases, as for instance shown in Fig. 2B for non-ideal configuration 250, the loudspeaker boxes 105 to 108 do not have an optimum orientation and will be pointing outside a listening area 203.

In the present embodiment, all loudspeakers 105 to 108, 202 are equipped with one omni-directional microphone (101 to 104, 204). This enables the measurement of the acoustical transfer functions between all loudspeakers 105 to 108, 202, the so-called "cross loudspeaker transfer functions". It is possible to make use of these transfer functions to get an idea of the orientation of the loudspeaker boxes 105 to 108, 202 with respect to the listener 201 and to provide the necessary corrections.

Fig. 3 shows two examples of cross loudspeaker transfer function measurements.

In a first scenario 300, the loudspeaker box 1 is properly oriented. In a second scenario 350, the loudspeaker 4 is wrongly oriented.

In the first scenario 300 as shown in Fig. 3A, the transfer functions between loudspeaker 1 and the others are measured. This may give an idea on the directivity of loudspeaker box 1. Because the directivity of a loudspeaker driver increases with frequency, a comparison of the high frequency content of the transfer functions can provide an idea of orientation of loudspeaker 1. Because the positions of the loudspeaker boxes can be

computed, it can be possible, by interpolation, to estimate the high frequency energy level reaching the center of the listening area 203, where the listener 201 is assumed to be sitting. In the second scenario 350 as shown in Fig. 3B, it is the directivity of loudspeaker 4 that is measured. In this case, the other loudspeakers will get much less high frequency energy than in the first scenario 300, which indicates that loudspeaker 4 is most likely wrongly oriented. By computing the level of high frequencies reaching the middle of the listening area 203 for the second scenario 350 and by comparing it with its level for the first scenario 300, a high frequency boost filter to be applied to loudspeaker 4 can be derived.

In the following, referring to Fig. 4, a block diagram 400 will be explained illustrating a method of processing audio data according to an exemplary embodiment of the invention. Such a method may work according to the following process:

All cross loudspeaker transfer functions are measured, see block 410.

The loudspeaker positions are computed (for instance by evaluating intensities, applying damping models, analyzing delays, analyzing correlations between different signals, evaluating frequency information, considering directivity characteristics, evaluating propagation times in combination with propagation velocities, etc.), see block 420.

The listening position is user-defined or assumed to be the geometrical center of the area enclosed by the loudspeakers, or assumed to be in front of the TV set, see block 430.

For each loudspeaker, the high frequency energy level radiated in the direction of the listening position is computed by interpolating the high frequency content of the different cross loudspeaker measurements. Because of the oval shape of the loudspeaker directivity, the interpolation may be non-linear, see block 440.

The high frequency energy levels of all loudspeakers are normalized to the highest one. In other words, the high frequency energy radiated towards the listening position is made equal for all loudspeakers, and preferably equal to the highest high frequency energy level value, see block 450.

It should be noted that the term "comprising" does not exclude other elements or features and the "a" or "an" does not exclude a plurality. Also elements described in association with different embodiments may be combined.

It should also be noted that reference signs in the claims shall not be construed as limiting the scope of the claims.

CLAIMS:

1. A device (100) for processing audio data, wherein the device (100) comprises at least one microphone (101 to 104) each adapted to detect audio data (114 to 117);

a plurality of speakers (105 to 108) each adapted to emit acoustic waves, wherein at least a part of the plurality of speakers (105 to 108) is provided with an assigned one of the at least one microphone (101 to 104);

a calculation unit (113) adapted to calculate acoustical transfer functions (118) between the plurality of speakers (105 to 108) based on the audio data (114 to 117) detected by the at least one microphone (101 to 104);

a determining unit (119) adapted to determine orientation information (120) indicative of the relative orientation of the plurality of speakers (105 to 108) based on the calculated acoustical transfer functions (120).

2. The device (100) according to claim 1,

wherein the calculation unit (113) is adapted to calculate the acoustical transfer functions (118) for each pair of the plurality of speakers (105 to 108) based on the audio data (114 to 117) detected by the at least one microphone (101 to 104).

3. The device (100) according to claim 1,

wherein the determining unit (119) is adapted to determine the orientation information (120) indicative of a spatial position and/or of an audio emission direction of the plurality of speakers (105 to 108).

4. The device (100) according to claim 1,

wherein, for at least a part of the plurality of speakers (105 to 108), a respective one of the plurality of speakers (105 to 108) and the assigned one of the at least one microphone (101 to 104) are accommodated in a separate casing (109 to 112).

5. The device (100) according to claim 1,
comprising a correction unit (121) adapted to correct an audio playback characteristic of at least a part of the plurality of speakers (105 to 108) based on the determined orientation information (121).

6. The device (100) according to claim 1,
comprising a correction unit (121) adapted to correct the orientation of at least a part of the plurality of speakers (105 to 108) based on the determined orientation information (120).

7. The device (100) according to claim 5 or 6,
wherein the correction unit (121) is adapted to correct the audio playback characteristic so as to improve an audio quality at a predetermined listening position.

8. The device (100) according to claim 5 or 6,
wherein the predetermined listening position is one of the group consisting of a user-defined position, a geometrical center of the plurality of speakers (105 to 108), and a position defined with respect to a defined component (202) of an audio playback system comprising the device (100).

9. The device (100) according to claim 5,
wherein the audio playback characteristic comprises at least one of an amplitude, a frequency filtering characteristic, and an equalizer characteristic.

10. The device (100) according to claim 1,
wherein the calculation unit (119) is adapted to calculate the acoustical transfer functions (120) between the plurality of speakers (105 to 108) selectively based on components of the audio data (114 to 117) which components exceed a predetermined frequency threshold value.

11. The device (100) according to claim 10,
wherein the predetermined frequency threshold value is in the range between essentially 1 kHz and essentially 5 kHz.

12. The device (100) according to claim 1,

wherein at least one of the at least one microphone (101 to 104) is an omni-directional microphone.

13. The device (100) according to claim 1,

realized as at least one of the group consisting of an audio surround system, a stereo audio system, a mobile phone, a headset, a hearing aid, a hands free system, a television device, a video recorder, a monitor, a gaming device, a laptop, an audio player, a DVD player, a CD player, a hard disk-based media player, an internet radio device, a public entertainment device, a portable audio player, an MP3 player, a hi-fi system, a vehicle entertainment device, a car entertainment device, a medical communication system, a body-worn device, a speech communication device, a home cinema system, and a music hall system.

14. A method of processing audio data (114 to 117), wherein the method comprises

detecting audio data (114 to 117) using at least one microphone (101 to 104);

emitting acoustic waves using a plurality of speakers (105 to 108), wherein at least a part of the plurality of speakers (105 to 108) is provided with an assigned one of the at least one microphone (101 to 104);

calculating acoustical transfer functions (118) between the plurality of speakers (105 to 108) based on the audio data (114 to 117) detected by the at least one microphone (101 to 104);

determining orientation information (120) indicative of the relative orientation of the plurality of speakers (105 to 108) based on the calculated acoustical transfer functions (118).

15. A computer-readable medium, in which a computer program of processing audio data (114 to 117) is stored, which computer program, when being executed by a processor (113, 119), is adapted to carry out or control a method according to claim 14.

16. A program element of processing audio data (114 to 117), which program element, when being executed by a processor (113, 119), is adapted to carry out or control a method according to claim 14.

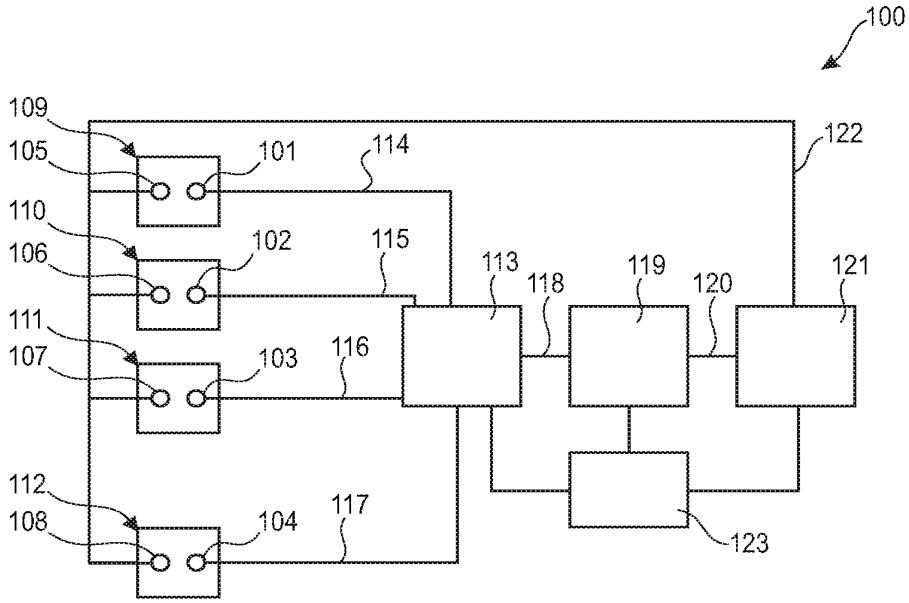



FIG 1

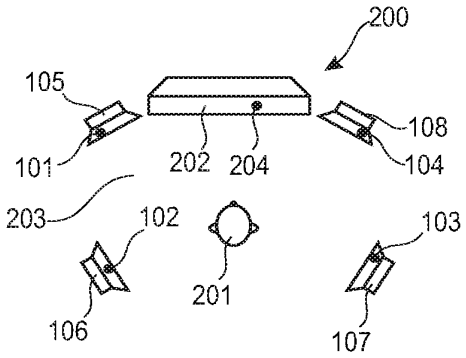



FIG 2A

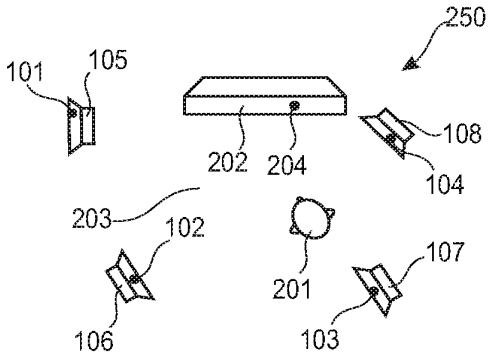



FIG 2B

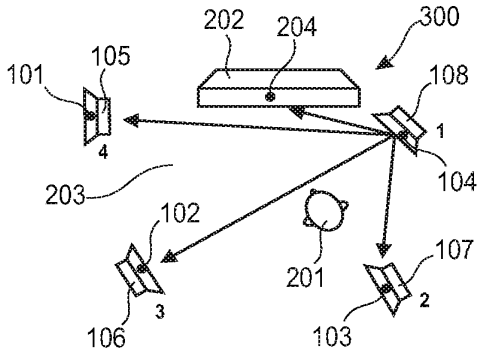



FIG 3A

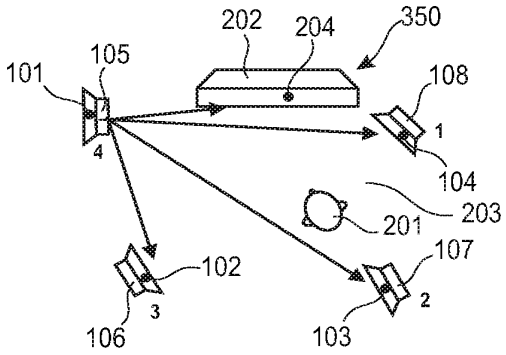



FIG 3B

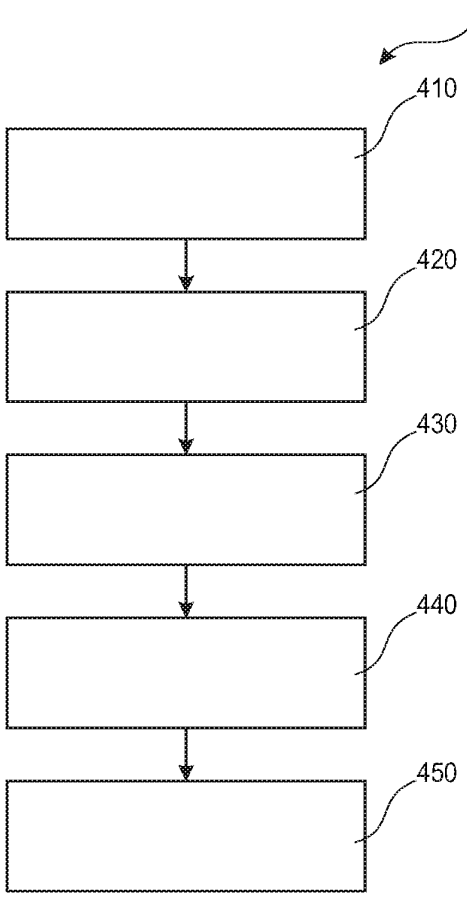



FIG 4

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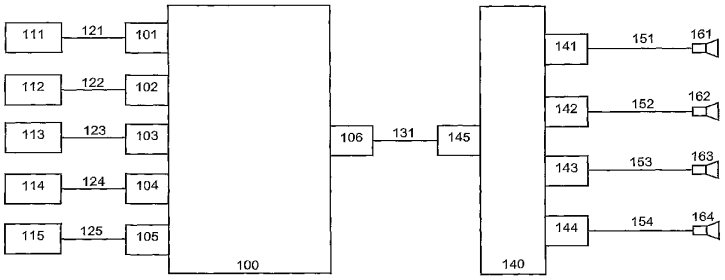
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(54) **Title:** DEVICE AND METHOD FOR PRIORITIZING AUDIO IN A VEHICLE




(57) **Abstract:** An improved device and method for prioritizing audio in a vehicle is disclosed. According to the invention, an audio priority device for use in a vehicle, includes a plurality of audio source input connectors, at least one output connector connectable to a sound emitting system, and a selecting means arranged to select the audio signal with highest priority level received at the input connectors and further arranged to output the selected audio signal to the at least one output connector. Each input connector is arranged assigned with a specific fixed priority level, whereby a present audio signal from an audio source that is connected to one of the input connectors is assigned the priority level of that input connector.

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# DEVICE AND METHOD FOR PRIORITIZING AUDIO IN A VEHICLE

## Field of the invention

The present invention relates to an audio priority device for use in a vehicle including a selecting means arranged to select an audio signal. The present invention also relates to a vehicle including such an audio priority device and to a method for prioritizing audio in a vehicle.

## Related art and background of the invention

Audio management systems managing signals from a number of audio sources are previously known in the background art. These systems include a plurality of audio sources and a selecting means arranged to select one of the audio signals and to output the selected audio signal to a sound emitting system, as one single sound emitting system handles signals from a plurality of audio sources. Such audio management systems are known from documents EP 0 531 094, EP 1 056 216 and US 6 052 471.

EP 0 531 094 shows a system for integrated cellular telephone and vehicular audio. In this system, an interface selects which one of the cellular telephone signal and the audio system signal to present to a driver of the vehicular. Control signals are sent on a control bus from the cellular telephone and the audio system to the interface, informing the interface whether the cellular phone and the audio system are active or in use. The interface controls, based on these control signals, which audio source to apply to the loud speakers of the system.

EP 1 056 216 shows an audio component system. In this system, a number of audio devices are connected to an amplifier unit. The amplifier unit controls, by the use of a control unit and a control bus connected to each of the audio devices, which device that is to be delivered to the loud speakers of the system.

US 6 052 471 shows an audio receiver that automatically selects an input audio source. The receiver detects which input signals that are present and then a priority

logic block selects, using a priority table, which audio source to provide to the amplifiers. The priority table contains the priorities of the different types of audio sources present and sets the rules for how to select an audio source to be amplified for different scenarios of audio sources present. The priority logic block then, by the use of control signals, controls switches in the receiver such that the chosen audio source is passed through to amplification. The priority of different types of audio sources can for instance be set such that a CD player has a higher priority than a radio, resulting in that the receiver selects the CD player when they both are active. The priority can also be set such that the type of audio source that is most recently turned into an active mode is given the highest priority. That is if a TV is most recently turned on it will be given highest priority and will thus be selected regardless of which other audio sources are being present.

The background art solutions for audio management are all fairly complicated. The background art systems include control circuits and control buses for managing the audio sources and/or complex priority setting and selecting processes.

When installing audio management systems in vehicles, such as trucks, cars, buses and tractors, there arises a problem regarding installation space. The amount of space behind a dashboard available for fitting in audio management systems and cables accompanying these systems is very limited. According to the solutions in background art documents EP 0 531 094 and EP 1 056 216 mentioned above, a control bus is used for controlling which audio source to be selected. This control bus constitutes a problem because of the limited installation space in the vehicle, especially since these audio management systems often are installed after the vehicle has been assembled in a factory.

Weight of the cables can be another problem in solutions involving a large amount of cabling. Troubleshooting can also be very difficult and time consuming when a problem arises in such a system.

Audio management systems that rely on control signals to or from each of the audio source components of the system for handling the selection of audio sources to

output to a sound emitting system, such as a number of loud speakers, will also encounter difficulties relating to the different types of control signaling used by the different audio sources. The different audio sources are often provided by different suppliers and these different audio sources may then have differing control signaling. For instance, the signaling format, such as levels and shapes of the signals, can differ from one audio source to another. The different control signaling can result in difficulties for the audio management system to communicate with all audio source components in the system.

There is further a problem related to complex priority setting and selecting processes of background art solutions, such as the one mentioned in US 6 052 471 above, regarding their capabilities of being able to easily alter priorities of already present audio sources as well as easily assigning priorities to audio sources that are not known by the system at the time of installation of the system, but can be added to the system thereafter. Background art systems need to be reprogrammed when priorities are to be changed or when new audio sources are to be added to the system. Reprogramming is time consuming and expensive for the vehicle owner.

**Aim and most important features of the invention**

It is an object of the present invention to provide an audio priority device that solves the above stated problems.

The present invention aims to provide a future compatible, more simple, less space consuming, lighter and less costly audio priority device than the devices known from audio management system in the background art.

The object is achieved by the above mentioned audio priority device according to the characterizing portion of claim 1, i.e. that each input connector is arranged invariably assigned with a specific fixed priority level, whereby a present audio signal from an audio source that is connected to one of said input connectors is assigned the specific priority level of that input connector to which the audio source is connected.

One embodiment of the audio priority device according to the present invention comprises that the specific priority level of each input connector is assigned in the selecting means.

Another embodiment of the audio priority device according to the present invention comprises that the input connectors are arranged assigned with mutually different priority levels.

The object is also achieved by the above mentioned vehicle according to the characterizing portion of claim 11.

The object is also achieved by the above mentioned method according to the characterizing portion of claim 12, i.e. that a present audio signal from an audio source connected to an input connector is assigned a priority level corresponding to a specific priority level invariably assigned for that input connector at which the audio source is present, and that all of the audio source input connectors are assigned with mutually different priority levels.

The general idea of the present invention is to assign a priority level to an audio source signal in correspondence to the audio source connector through which the audio source is connected to the audio priority device. The priorities for the audio sources are thus set by the operation of connecting the audio source cables to a suitable audio source input connector, which simplifies changes of the priority order of the audio source signals, since no reprogramming of the device is needed when priorities need to be changed or when new audio sources are added to the system. Further, no control cables between the audio sources and the audio priority device are needed in the audio management system according to the present invention, which makes the system less space consuming, lighter, less costly and easier to troubleshoot.

In different embodiments of the present invention, the amplification of the audio signals is performed in different locations of the system. The amplification circuits may be integrated with the audio sources, with the audio priority device or with a

radio subsequent to the audio priority device. The amplification circuits may also be located in an external amplification stage subsequent of the audio priority device. These different locations of the amplifying circuitry have different advantages. Amplification within the audio sources has the advantage that amplifying circuitry already existing in the audio sources may be used. Amplification within or subsequent to the audio priority device has the advantage that low level signal cables may be used from the audio sources to the location where the amplification takes place, which makes use of more simple, smaller and less costly cables possible. Amplification within, for instance, a radio in a stage subsequent to the audio priority device has the advantage that RDS (Radio Data System) interruptions are very easily achieved.

Detailed exemplary embodiments and advantages of the device and method for prioritizing audio according to the invention will now be described with reference to the appended drawings illustrating some preferred embodiments.

**Brief description of the drawings**

Fig. 1 shows an audio management system including an audio priority device according to an embodiment of the present invention.

Fig. 2 shows a schematic view of an audio priority device according to the present invention.

Fig. 3 shows an audio management system including an audio priority device according to an embodiment of the present invention.

Fig. 4 shows an audio management system including an audio priority device according to an embodiment of the present invention.

Fig. 5 shows an audio management system including an audio priority device according to an embodiment of the present invention.

Fig. 6 shows a flowchart corresponding to a method of an embodiment of the present invention.

**Detailed description of preferred embodiments**

Fig. 1 shows an audio management system including an audio priority device 100 according to an embodiment of the present invention. In the audio management system, a number of audio sources 111-115, provide audio signals to an audio priority device 100. These audio sources may include music creating systems, such as radios, CD players, mp3 players or the like; communication equipment, such as mobile telephones, communication radios or the like; multimedia equipment, such as DVD players or the like; navigation systems, such as Global Positioning Systems (GPS) or the like; and safety systems, such as Lane Departure Warning (LDW) systems or the like. In an audio management system according to the present invention, any present or future audio source may be incorporated in the system, since this is easily achieved.

Audio signals provided by the audio sources are sent to the audio priority device over audio source cables 121-125. The audio source cables are connected to audio source input connectors 101-105 of the audio priority device 100. The audio priority device 100, e.g. through a selecting means (not shown), chooses or selects which of the audio sources that should be forwarded to a sound emitting system and outputs the signal corresponding to the selected audio source on the output connector 106. The selected signal is sent to an amplifier 140 over an output cable 131 and is received at the amplifier 140 in an amplifier input connector 145. The amplifier 140 amplifies the selected signals and provides them via amplifier output connectors 141-144 and speaker cables 151-154 to speakers 161-164.

According to the present invention, the selection of audio sources to be forwarded to the sound emitting system is related to which one of the audio source input connectors 101-105 the audio source is connected to. Each one of the audio source input connectors 101-105 is assigned a specific priority level. This priority level is invariably assigned and preferably mutually different for each of the audio source input connectors 101-105, so that every audio source signal, regardless of which type

of signal, present at one of these audio source input connectors 101-105 is assigned the corresponding specific priority level as that assigned to the audio source input connector at which it is present.

The priority level assigned to an audio source signal is, according to the present invention, thus not related to the type of audio source from which it originates, as was the case in background art solutions. The priority level assigned to an audio source signal is instead only related to the specific audio source input connector 101-105 to which the audio source is connected. This means that the priorities for the audio sources are set by the operation of connecting the audio source cables 121-125 to a suitable audio source input connector 101-105. To change the priority order of the audio source signals, a simple operation of switching the corresponding audio source cable to another audio source input connectors has to be performed.

This is an improvement compared to background art solutions, since no reprogramming of the device is needed when priorities need to be changed or when new audio sources are added to the system. In background art solutions, a complex priority decision table or the like is used for deciding which audio source to select. If a new audio source is added to the background art systems or if priorities are to be changed, this priority decision table need to be altered, which means that the circuits or processors need to be reprogrammed or otherwise adjusted by a skilled person. This can be troublesome, time consuming and costly for the vehicle owner. In an audio management system according to the present invention, an unskilled person can easily switch audio source input connectors used, when priorities for the audio sources are to be changed. He may also easily connect a new audio source to a suitable audio source connector and thereby assigning the new audio source a suitable priority level.

Further, no control cables between the audio sources 111-115 and the audio priority device 100 are needed in the audio management system according to the present invention. Less cabling is an advantage, since cables are space consuming, heavy and expensive. Troubleshooting is further difficult in systems having excessive cabling.

The number of audio sources, audio source cables, audio source input connectors, audio source output connectors, output cables, amplifier input connectors, amplifier output connectors, speaker cables and speakers in the audio management system may vary. The system according to the present invention can easily be modified to any number of audio sources. The number of speakers is set by the amplifier 140 and can thus be varied in a large number of ways. The audio source cables 121-125 and output cable 131 can in this embodiment of the invention include a number of different types of cables. Single cables as well as data buses, such as CAN (Controller Area Network), MOST (Media Oriented Systems Transport), Byteflight, TTCAN (Time Triggered Controller Area Network), Flexray, LIN (Local Interconnected Network) or the like, can be used for these cables.

Further, according to this embodiment of the present invention, the amplifier 140 is common to all the audio sources. All audio sources 121-125 therefore provide low level signals. This has the advantage that the audio source cables 121-125 and the output cable 131 can be implemented using low level signal cables that are less costly, less heavy and smaller in size than high level signal cables. The solution having one common amplifier also has the advantage that a separate amplifier in each of the audio sources can be omitted, since the single amplifier handles amplification of signals from all audio sources. The common amplifier solution according to the present invention thus lowers the overall cost of the audio system.

Fig. 2 shows a schematic view of a possible implementation of an audio priority device 200. The audio priority device 200 has a number of audio source input connectors 201-205 and an output connector 206. Cables conveying audio signals from the audio sources are connected to the connectors 201-205 and are provided to a selecting means 270 on signal lines 271-275. A selection switch 276 within the selecting means 270 is then switched into a position that lets the chosen signal through to the output connector 206. The audio source input connectors 201-205 all have a fix specific priority level assigned to them. For example, the audio source input connector 201 may have been assigned the highest priority level and the audio source input connectors 202-205 may have decreasing priority levels compared to

the audio source input connector 201, such that connector 202 has a lower assigned priority level than connector 201, connector 203 has a lower assigned priority level than connector 202 and so forth.

For example, if there are signals present at both the audio source input connectors 201 and 202 then the signal present at audio source input connector 201 will be selected since the selection switch will select the signal present on the input connector having, i.e. being assigned with, the highest priority level. On the other hand, if there is no signal present at audio source input connector 201 but at audio source input connectors 202 and 203 then the signal present at audio source input connector 202 will be selected.

The schematic view of audio priority device 200 shown in fig. 2 is not meant to show all details of the audio priority device, but is more meant to illustrate a general selection process of the device. A more detailed view of the audio priority device 200 may further include signal detection circuits for detection of whether there are signals present at the audio source connectors 201-205, a control circuit for controlling the selection switch 276 and wiring carrying control signals. There are, as is clear to a skilled person, a number of ways to implement the details within the selecting means 200. The implementation may be a hardware implementation, a software implementation or any combination of the both.

Fig. 3 shows an audio management system including an audio priority device according to another embodiment of the present invention. According to this embodiment of the audio priority device, an amplifier 340 is included within the audio priority device casing 300. Otherwise, the audio priority device 300, audio sources 311-315, audio source cables 321-325, audio source input connectors 301-305, amplifier output connectors 342-345, speaker cables 351-354 and speakers 361-364 correspond to the parts in the audio management system shown in fig. 1.

According to the embodiment of the invention shown in fig. 3, the amplifier circuit 340 used for amplifying all audio signals in the audio management system is integrated with the audio priority device 300. This means that no amplification is needed within

the audio sources 311-315, which results in less costly audio resources, and that low level signal cables can be used for the audio source cables 321-325, which results in use of lighter, less costly and less space consuming audio source cables.

Fig. 4 shows an audio management system including an audio priority device according to another embodiment of the present invention. According to this embodiment of the audio priority device, amplifiers 471-475 are included within the casing of the audio sources 411-415. According to this embodiment, the audio priority device 400, audio source cables 421-425 and audio source input connectors 401-405 are designed for coping with high level audio signals being outputted from the amplifiers 471-475. The amplifier output connectors 442-445, speaker cables 451-454 and speakers 461-464 correspond to the parts in the audio management system shown in fig. 1.

This embodiment has the advantage that it uses amplifiers circuits 471-475 already present in the audio sources 411-415. The audio sources 411-415 may have amplifying circuits installed by the producer of the audio sources. If it is desirable to use these built in amplifiers, this embodiment is suitable to use.

Fig. 5 shows an audio management system including an audio priority device according to another embodiment of the present invention. According to this embodiment, it is also possible to have an audio source 546, such as a radio, with an integrated amplifier coupled after the audio priority device 500, between the audio priority device 500 and the speakers 561-564 or some of the speakers. According to this embodiment of the audio priority device, an amplifier 540 is included in the audio source 546. The audio priority device 500, audio source cables 521-525, audio source input connectors 501-505, the output connector 506, the output cable 531, the amplifier input connector 541, the amplifier output connectors 542-545, speaker cables 551-554 and speakers 561-564 correspond to the parts in the audio management system shown in fig. 1. This embodiment has the advantage that if the audio source 546 itself creates a high priority signal, it can easily output this signal. For instance, if the audio source 546 is a radio having RDS (Radio Data System) then the RDS interruptions may be easily achieved and outputted to the speakers.

As a skilled person realises, combinations of the different solutions in figs. 1, 3, 4 and 5 may be used in a combination audio management system. That is, different locations of the amplifying circuits may be advantageous for different audio sources. Some audio sources may have integrated amplifiers and for some audio sources it is more advantageous to have the amplifying circuits in a separate amplifying stage, in a subsequent radio or integrated in the audio priority device.

Fig. 6 shows a flowchart corresponding to a method of an embodiment of the present invention. In a first step of the method, an audio priority device receives signals from one or more audio sources being connected to input connectors of the audio priority device. In a second step of the method, the audio signal having the highest priority level received at said input connectors is selected. The priority level of each audio signal is set by a fix priority level specific for the input connector to which it is connected. In a third step of the method, the selected audio signal is outputted to at least one output connector of the audio priority device.

The device and method for prioritizing audio according to the invention may be modified by those skilled in the art, as compared to the exemplary embodiments described above.

As is obvious for a skilled person, a number of other implementations, modifications, variations and/or additions can be made to the above described exemplary embodiments. It is to be understood that the invention includes all such other implementations, modifications, variations and/or additions which fall within the scope of the claims.

## Claims

1. An audio priority device for use in a vehicle, including
- a plurality of audio source input connectors,
- at least one output connector connectable to a sound emitting system, and
- a selecting means arranged to select the audio signal with the highest priority level provided at said input connectors and further arranged to output the selected audio signal to said at least one output connector,
**characterized in** that each input connector is arranged invariably assigned with a specific priority level, whereby a present audio signal from an audio source that is connected to one of said input connectors is assigned the specific priority level of that input connector to which the audio source is connected.

2. Audio priority device as claimed in claim 1, wherein said audio priority device is arranged for receiving low level audio signals from said audio sources.

3. Audio priority device as claimed in claim 2, wherein said audio priority device includes an amplifier, located before said at least one output connector, amplifying audio signals outputted from the device.

4. Audio priority device as claimed in claim 2, wherein said at least one output connector is connected to an amplifying stage, external from the audio priority device.

5. Audio priority device as claimed in claim 2, wherein said at least one output connector is connected to a radio including an amplifying stage.

6. Audio priority device as claimed in claim 1, wherein said audio priority device is arranged for receiving high level audio signals from said audio sources.

7. Audio priority device as claimed in claim 1, wherein said sound emitting system is a loud speaker system.

8. Audio priority device as claimed in claim 1, wherein said audio sources include at least one of the following audio sources in the group: radio, CD player, mp3 player, mobile telephone, DVD player, navigation system, Lane Departure Warning (LDW) system.

9. Audio priority device as claimed in claim 1, wherein the specific priority level of each input connector is assigned in said selecting means.

10. Audio priority device as claimed in any one of claims 1-9, wherein said input connectors are arranged assigned with mutually different priority levels.

11. A vehicle **characterized in** that it includes an audio priority device as the one claimed in any one of claims 1-10.

12. Method for prioritizing audio in a vehicle, including the steps of:
- receiving, in an audio priority device, signals from one or more audio sources, said audio sources each being connected to a respective input connector of said audio priority device
- selecting the audio signal with the highest priority level received at said input connectors,
- outputting the selected audio signal to at least one output connector of said audio priority device,
**characterized in** that an audio signal present at one of said input connectors is assigned a priority level corresponding to a specific priority level invariably assigned to that input connector at which the audio source is present, and that all of said audio source input connectors are assigned with mutually different priority levels.

13. Method as claimed in claim 12, wherein a priority level assigned to an audio source is changed by switching said audio source to another input connector.

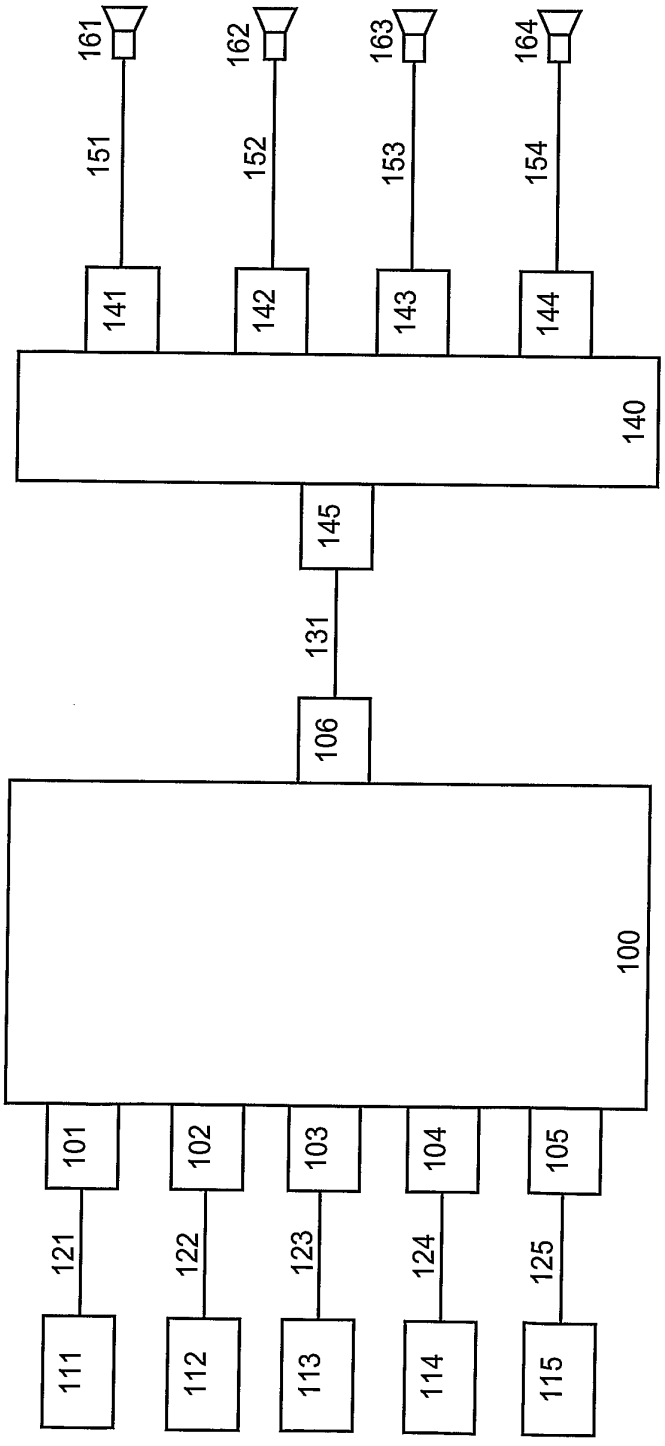

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Fig. 1

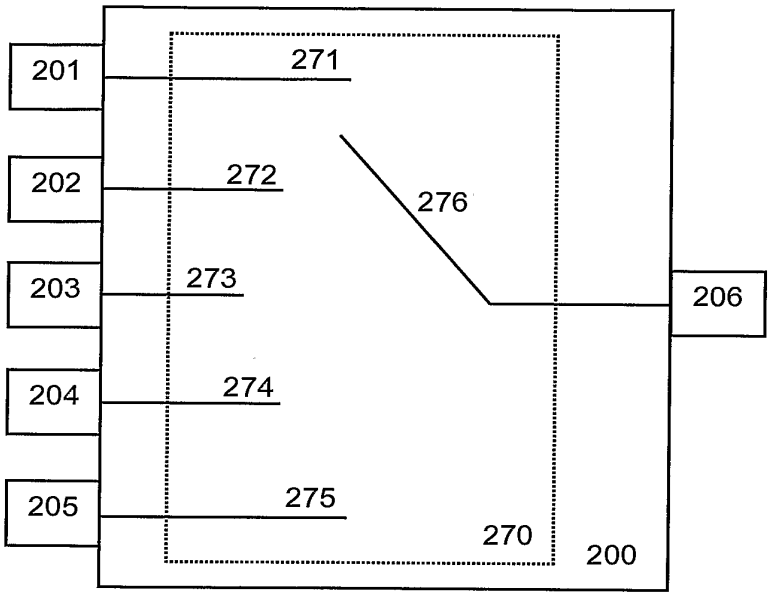



**Fig. 2**

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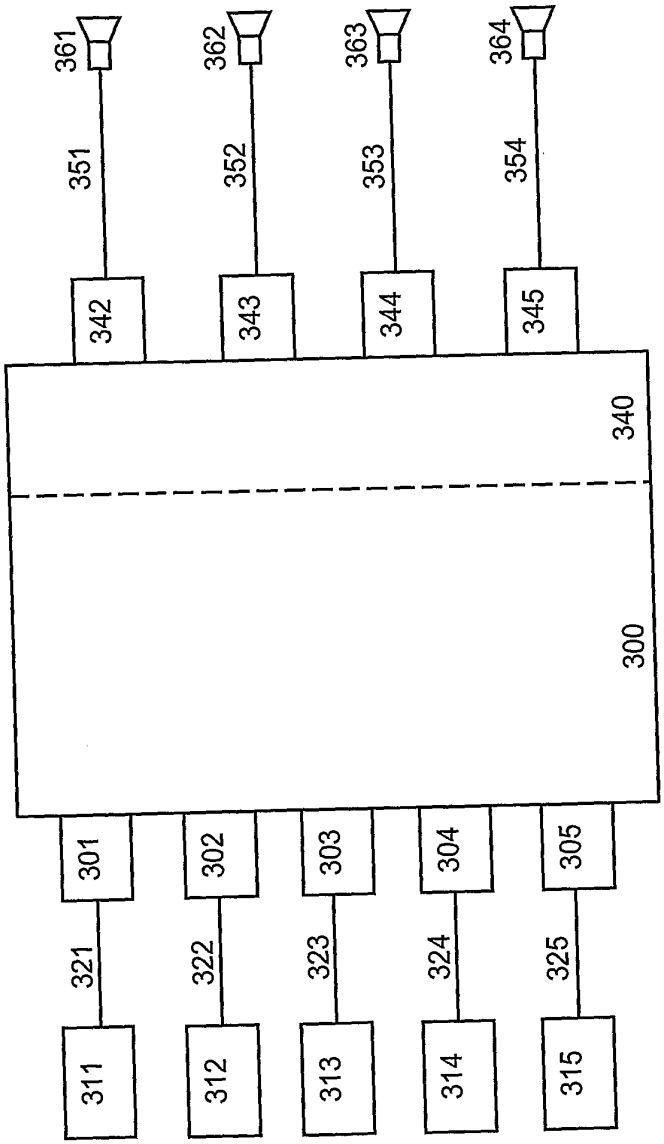

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Fig. 3

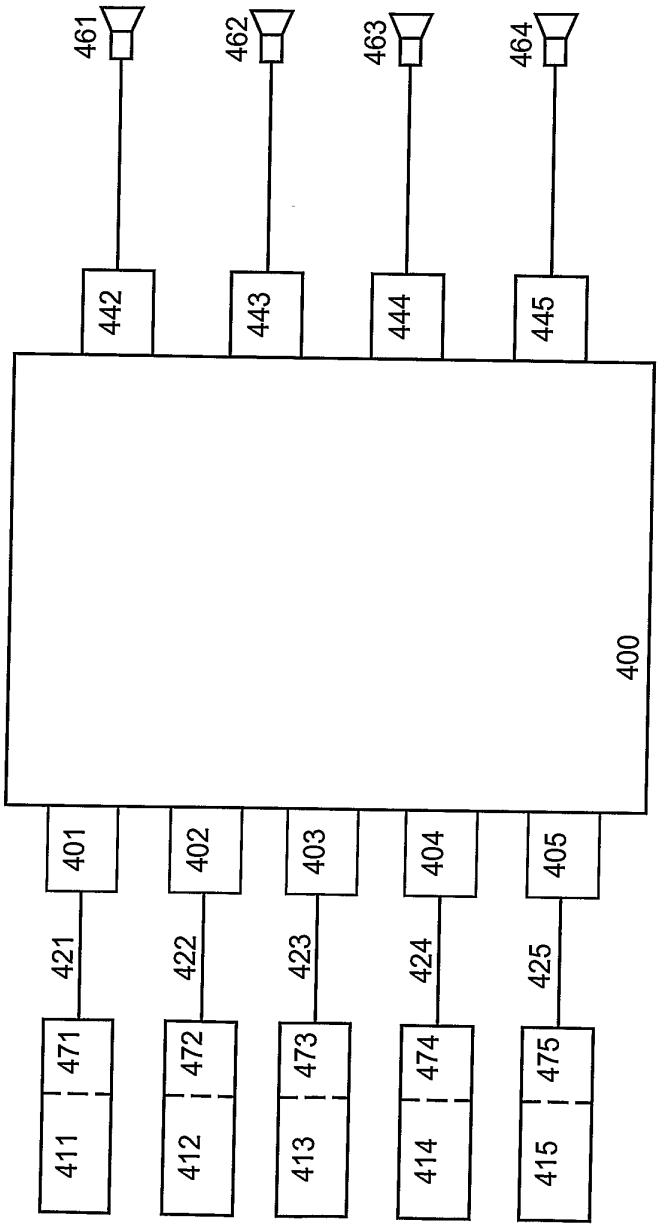

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Fig. 4

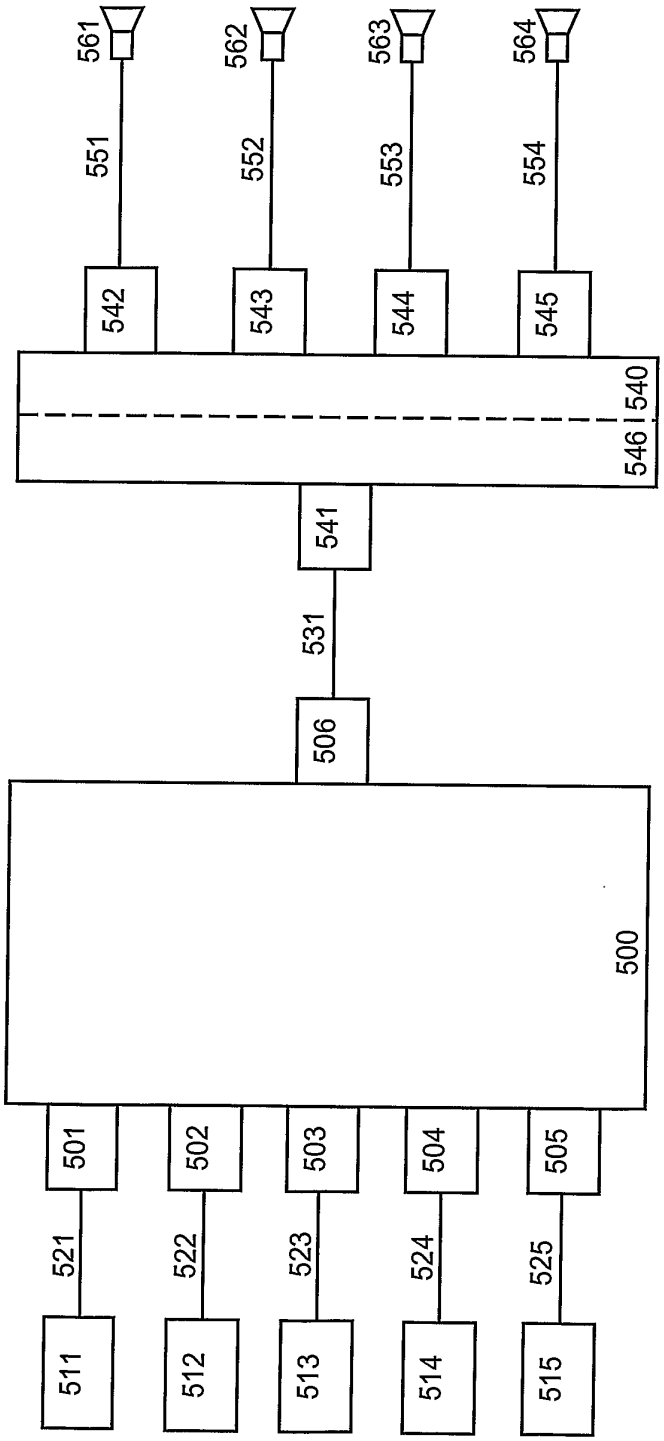

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Fig. 5

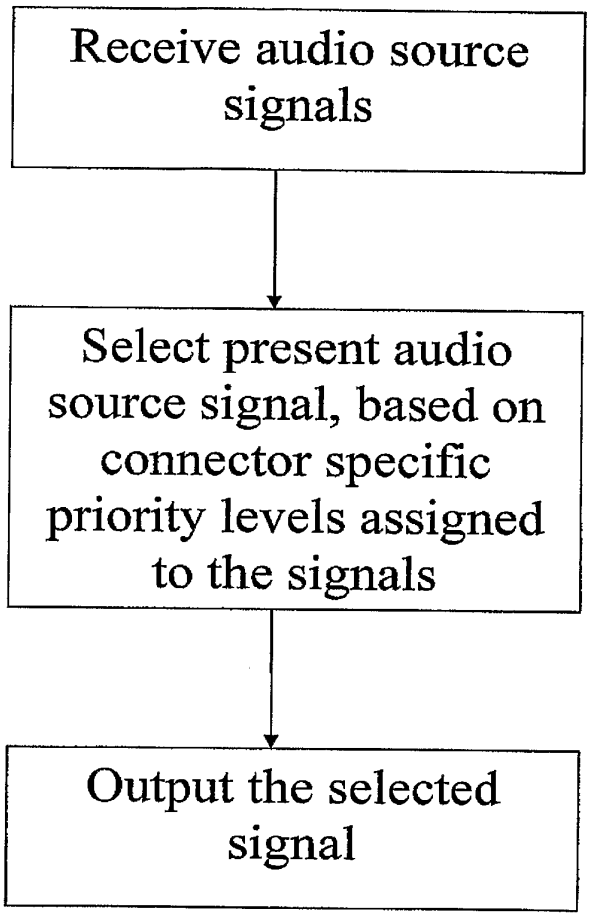

Receive audio source signals
Select present audio source signal, based on connector specific priority levels assigned to the signals
Output the selected signal

Fig. 6

# INTERNATIONAL SEARCH REPORT

International application No.
PCT/SE2007/051047

A. CLASSIFICATION OF SUBJECT MATTER

IPC: 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)

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

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

EPO-INTERNAL, WPI DATA, PAJ

C. DOCUMENTS CONSIDERED TO BE RELEVANT

| Category* | Citation of document, with indication, where appropriate, of the relevant passages | Relevant to claim No. |
|---|---|---|
| A | EP 1460769 A1 (PHONAK COMMUNICATIONS AG), 22 Sept 2004 (22.09.2004), paragraphs [0007]-[0009], [0026], [0036], [0038] | 1-13 |
| A | US 5774016 A (KETTERER, E R), 30 June 1998 (30.06.1998), column 3, line 66 - column 4, line 32, claim 3 | 1-13 |
| A | WO 2005055046 A1 (VOLVO TECHNOLOGY CORPORATION), 16 June 2005 (16.06.2005), the whole document | 1-13 |
| A | US 6052471 A (VAN RYZIN, J M), 18 April 2000 (18.04.2000), column 2, line 2 - line 63 | 1-13 |

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

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| Date of the actual completion of the international search | Date of mailing of the international search report |
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| 1 April 2008 | 03 -04- 2008 |
| Name and mailing address of the ISA/<br>Swedish Patent Office<br>Box 5055, S-102 42 STOCKHOLM<br>Facsimile No. +46 8 666 02 86 | Authorized officer<br>Bo Gustavsson/CC<br>Telephone No. +46 8 782 25 00 |

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**International patent classification (IPC)**
***H04B 1/20*** (2006.01)
***B60R 16/02*** (2006.01)

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Cited literature, if any, will be enclosed in paper form.

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| APPLICATION NO. | FILING DATE | FIRST NAMED INVENTOR | ATTORNEY DOCKET NO. | CONFIRMATION NO. |
|---|---|---|---|---|
| 13/864,248 | 04/17/2013 | Nicholas A. J. Millington | 13-0401 (MBHB 15-517-CON) | 5095 |

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The time period for reply, if any, is set in the attached communication.

| Office Action Summary | Application No. 13/864,248 | Applicant(s) MILLINGTON, NICHOLAS A. J. | |
|---|---|---|---|
| | Examiner OLEG SURVILLO | Art Unit 2442 | AIA (First Inventor to File) Status No |

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- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
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**Status**

1)☒ Responsive to communication(s) filed on *April 17, 2013*.

☐ A declaration(s)/affidavit(s) under **37 CFR 1.130(b)** was/were filed on _____.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ An election was made by the applicant in response to a restriction requirement set forth during the interview on _____; the restriction requirement and election have been incorporated into this action.

4)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims***

5)☒ Claim(s) *21-40* is/are pending in the application.

5a) Of the above claim(s) _____ is/are withdrawn from consideration.

6)☐ Claim(s) _____ is/are allowed.

7)☒ Claim(s) *21-40* is/are rejected.

8)☐ Claim(s) _____ is/are objected to.

9)☐ Claim(s) _____ are subject to restriction and/or election requirement.

* If any claims have been determined allowable, you may be eligible to benefit from the **Patent Prosecution Highway** program at a participating intellectual property office for the corresponding application. For more information, please see http://www.uspto.gov/patents/init_events/pph/index.jsp or send an inquiry to PPHfeedback@uspto.gov.

**Application Papers**

10)☐ The specification is objected to by the Examiner.

11)☒ The drawing(s) filed on *April 17, 2013* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

**Priority under 35 U.S.C. § 119**

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

**Certified copies:**

a)☐ All b)☐ Some** c)☐ None of the:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

** See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

1) ☒ Notice of References Cited (PTO-892)

2) ☒ Information Disclosure Statement(s) (PTO/SB/08a and/or PTO/SB/08b) Paper No(s)/Mail Date *See Continuation Sheet*.

3) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .

4) ☐ Other: _____.

Continuation of Attachment(s) 2). Information Disclosure Statement(s) (PTO/SB/08), Paper No(s)/Mail Date :05/08/13; 03/04/14; 04/15/14; 05/23/14; 07/07/14; 08/14/14; 11/26/14; 01/28/15; 03/20/15; 04/21/15; 05/31/15; 07/10/15; 08/22/15; 10/09/15; 11/23/15; 12/29/15; 02/11/16; 03/18/16; 05/20/16; 07/07/16.

The present application is being examined under the pre-AIA first to invent provisions.

## DETAILED ACTION

### *Response to Preliminary Amendment*

1. Claims 21-40 are pending in the application. No claims are currently amended. Claims 1-20 have been canceled. Claims 21-40 are new.

### *Response to Arguments*

2. With regard to Applicant's remarks dated April 17, 2013:

Preliminary amendment has been fully considered and is entered.

Amendment to the specification, abstract, and claims has been fully considered and is entered.

3. With regard to Applicant's remarks dated August 22, 2013:

Preliminary amendment has been fully considered and is entered.

Amendment to the title of the invention has been fully considered and is entered.

4. With regard to Applicant's remarks dated November 1, 2013:

Preliminary amendment has been fully considered and is entered.

Amendment to the specification has been fully considered and is entered.

### *Claim Rejections - 35 USC § 101*

35 U.S.C. 101 reads as follows:

> Whoever invents or discovers any new and useful process, machine, manufacture, or composition of matter, or any new and useful improvement thereof, may obtain a patent therefor, subject to the conditions and requirements of this title.

5. Claims 35-40 are rejected under 35 U.S.C. 101 because the claimed invention is directed to non-statutory subject matter.

As to claim 35, use of the word "system" does not inherently mean that the claim is directed to a machine. A claim that includes terms that imply that the invention is directed to a product, for instance by reciting "a plurality of zone players and a user interface module", but fails to include tangible limitations in accordance with its broadest reasonable interpretation is not limited to a practical application, but rather wholly embraces or encompasses the concept upon which the invention is based. This is impermissible as such claim coverage would extend to every way of applying the abstract idea, law of nature or natural phenomenon (i.e. non-statutory implementations).

In the instant case, only if at least one of the clamed elements of the system is a physical part of the system can the system as claimed be a machine within the meaning of 35 U.S.C. 101. The instant claim fails to identify any of such hardware elements of the system that would make it a machine within the meaning of 35 U.S.C. 101. In particular, "a plurality of zone players and a user interface module" are broad enough to be implemented in software per se.

Claims 36-40 fail to correct the deficiency of claim 35 and thus are rejected for analogous reasons.

***Claim Rejections - 35 USC § 102***

The following is a quotation of the appropriate paragraphs of pre-AIA 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

6. Claims 21, 23-28, and 30-40 are rejected under pre-AIA 35 U.S.C. 102(e) as being anticipated by Goldberg et al. (US 2007/0142944 A1).

As to claim 21, Goldberg teaches in a network comprising a plurality of zone players [units 100] (Fig. 1), including at least a first player and a second zone player [unit 100 of person A and unit 100 of person B] (Fig. 1), wherein the first zone player is designated as a master device of a synchrony group [broadcast unit 710 of cluster 700] (Fig. 6), a method comprising:

determining, by the first zone player, that the second zone player should be designated as the master device of the synchrony group [user of the broadcast unit 710 decides whether to transfer control in step 1132] (par. [0271], Fig. 16);

instructing, by the first zone player, the second zone player to be designated as the master device of the synchrony group [transferring decision back to the first receive unit 730, step 1134] (par. [0271], Fig. 16); and

causing, at the first zone player, the first zone player to lose its designation as the master device of the synchrony group [original broadcast unit 710 transmits to the

other cluster members the addresses of the sockets on the receive unit 730 that is now the new broadcast unit, and terminates its own multicast] (par. [0272], Fig. 16).

As to claim 23, Goldberg teaches that the first zone player determining that the second zone player should be designated as the master device of the synchrony group comprises the first zone player receiving, from a user interface module [each of a plurality of units 100 has a user interface] (par. [0103]), control information [user interacting with a unit 100 results in transmission of a signal to the unit] (par. [0267]), wherein the control information indicates that the first zone player should disengage from the synchrony group (par. [0271]-[0272]).

As to claim 24, Goldberg teaches disengaging, by the first zone player, the first zone player from the synchrony group (par. [0272]).

As to claim 25, Goldberg teaches transmitting, by the first zone player to the second zone player while the first zone player is designated as the master device of the synchrony group, a network address of an audio channelization device (par. [0185], [0260], [0265]), a multicast address that the audio information channelization device uses to broadcast audio information (par. [0272]-[0273]) and playback timing information over the network (par. [0201]-[0202]).

As to claim 26, Goldberg teaches that during the transmission, the second zone player is a slave device of the synchrony group [receive unit 730].

As to claim 27, Goldberg teaches receiving, at the first zone player while the first zone player is designated as the master device for the synchrony group, control information from a user interface module, wherein the control information indicates that a third zone player should be added to the synchrony group (par. [0181]-[0185], Figs. 14A and 14B); and

responsively transmitting, from the first zone player to the third zone player, slave control information, wherein the slave control information enables the third zone player to join the synchrony group as a slave device of the synchrony group (par. [0181]-[0185], Figs. 14A and 14B).

As to claim 28, Goldberg teaches a tangible computer-readable memory having instructions stored thereon [invention of Goldberg is computer-implemented thus inherently requires program instructions to operate] that when executed cause a first zone player that is designated as a master of the synchrony group to perform the method steps as discussed per claim 21 above.

As to claims 30-34, Goldberg teaches all the elements as discussed per claims 23-27 above.

As to claim 35, Goldberg teaches a system comprising:

a plurality of zone players (Fig. 1), wherein (i) at least two of the plurality of zone players are members of a synchrony group [cluster 700] (Fig. 6), (ii) one of the plurality of zone players is designated as a master device of the synchrony group [broadcast unit 710], and (iii) at least one of the plurality of zone players is designated as a slave device of the synchrony group [receive unit 730]; and

a user interface module [each of a plurality of units 100 has a user interface] (par. [0103]), wherein the user interface module is configured to transmit control information to the zone player currently designated as the master device of the synchrony group [user interacting with a unit 100 results in transmission of a signal to the unit] (par. [0267]), and wherein the control information causes the zone player currently designated as the master device of the synchrony group to instruct another member of the synchrony group currently designated as a slave device to become designated as the master of the synchrony group (par. [0271]-[0272]).

As to claims 36 and 37, Goldberg teaches all the elements as discussed per claims 23 and 24 above.

As to claim 38, Goldberg teaches that the control information is transmitted via a network interface (par. [0267], Fig. 16).

As to claims 39 and 40, Goldberg teaches all the elements as discussed per claims 25 and 26 above.

***Claim Rejections - 35 USC § 103***

The following is a quotation of pre-AIA 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

7. Claims 22 and 29 are rejected under pre-AIA 35 U.S.C. 103(a) as being unpatentable over Goldberg et al. in view of Ramankutty et al. (US Patent 6,917,592 B1).

As to claims 22 and 29, Goldberg teaches all the elements except the first zone player determining that it is overloaded.

Ramankutty teaches a primary server [primary LNS] determining that it is overloaded (col. 5 line 61 to col. 6 line 15) and switching over communication sessions between the primary server and a peer server (Fig. 2).

It would have been obvious to one of ordinary skill in the art at the time of the invention to modify the method and system of Goldberg by having the first zone player determining that the second zone player should be designated as the master device of the synchrony group comprise the first zone player determining that it is overloaded in order to offload communication sessions from the overloaded broadcaster to a less loaded device such as to improve quality of service.

***Conclusion***

Any inquiry concerning this communication or earlier communications from the examiner should be directed to OLEG SURVILLO whose telephone number is (571)272-9691. The examiner can normally be reached on Mon-Thu 10:00am - 7:30pm; Fri 10:00am - 6:30pm EST.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Glenton B. Burgess can be reached on 571-272-3949. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/OLEG SURVILLO/
Primary Examiner, Art Unit 2442

| Notice of References Cited | Application/Control No. 13/864,248 | Applicant(s)/Patent Under Reexamination MILLINGTON, NICHOLAS A. | |
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*A copy of this reference is not being furnished with this Office action. (See MPEP § 707.05(a).)
Dates in MM-YYYY format are publication dates. Classifications may be US or foreign.

Doc code: IDS
Doc description: Information Disclosure Statement (IDS) Filed

PTO/SB/08a (01-10)
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**INFORMATION DISCLOSURE STATEMENT BY APPLICANT**
**( Not for submission under 37 CFR 1.99)**

| | |
|---|---|
| Application Number | 13864248 |
| Filing Date | 2013-04-17 |
| First Named Inventor | NICHOLAS; A. J. Millington |
| Art Unit | 2442 |
| Examiner Name | SURVILLO, OLEG |
| Attorney Docket Number | SNS-71301US10(13-0401) |

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| | Attorney Docket Number | SNS-71301US10(13-0401) |

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**EXAMINER SIGNATURE**

| Examiner Signature | /Oleg Survillo/ | Date Considered | 09/06/2016 |
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PTO/SB/08a (03-15)
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| Examiner Name | SURVILLO, OLEG |
| Attorney Docket Number | 13-0401 (MBHB 15-517-CON) |

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| | First Named Inventor | NICHOLAS; A. J. Millington |
| | Art Unit | 2442 |
| | Examiner Name | SURVILLO, OLEG |
| | Attorney Docket Number | 13-0401 (MBHB 15-517-CON) |

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| | Art Unit | 2442 |
| | Examiner Name | SURVILLO, OLEG |
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|---|---|
| Application Number | 13864248 |
| Filing Date | 2013-04-17 |
| First Named Inventor | MILLINGTON, NICHOLAS A. J. |
| Art Unit | 2442 |
| Examiner Name | SURVILLO, OLEG |
| Attorney Docket Number | SNS-71301US10 (13-0401) |

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| | Examiner Name | SURVILLO, OLEG |
| | Attorney Docket Number | 13-0401 |

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| First Named Inventor | NICHOLAS; A. J. Millington |
| Art Unit | 2442 |
| Examiner Name | SURVILLO, OLEG |
| Attorney Docket Number | 13-0401 (MBHB 15-517-CON) |

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| | Art Unit | 2442 |
| | Examiner Name | SURVILLO, OLEG |
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| | Application Number | 13864248 |
| | Filing Date | 04-17-2013 |
| | First Named Inventor | NICHOLAS; A. J. Millington |
| | Art Unit | 2442 |
| | Examiner Name | SURVILLO, OLEG |
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| First Named Inventor | Nicholas A. J. Millington |
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| | Examiner Name | TBD |
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| First Named Inventor | MILLINGTON; Nicholas A.J. |
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| | First Named Inventor | MILLINGTON; Nicholas A.J. |
| | Art Unit | 2442 |
| | Examiner Name | SURVILLO, Oleg |
| | Attorney Docket Number | 13-0401 (MBHB 15-517-CON) |

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| | Filing Date | 04-17-2013 |
| | First Named Inventor | NICHOLAS; A. J. Millington |
| | Art Unit | 2442 |
| | Examiner Name | SURVILLO, OLEG |
| | Attorney Docket Number | 13-0401 (MBHB 15-517-CON) |

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| | Art Unit | 2442 |
| | Examiner Name | SURVILLO, OLEG |
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|---|---|---|
| | Application Number | 13864248 |
| | Filing Date | 2013-04-17 |
| | First Named Inventor | Millington, Nicholas A.J. |
| | Art Unit | 2442 |
| | Examiner Name | SURVILLO, OLEG |
| | Attorney Docket Number | SNS-71301US10 (13-0401) |

| Examiner Initial* | Cite No | Foreign Document Number[3] | Country Code[2] | Kind Code[4] | Publication Date | Name of Patentee or Applicant of cited Document | Pages,Columns,Lines where Relevant Passages or Relevant Figures Appear | T[5] |
|---|---|---|---|---|---|---|---|---|
| /O.S./ | 1 | 2713281 | EP | | 2004-04-02 | SONOS, INC. | | ☐ |
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| | Attorney Docket Number | SNS-71301US10 (13-0401) |

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| | Examiner Name | SURVILLO, OLEG |
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**CONFIRMATION NO. 5095**

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|---|---|---|---|---|
| 13/864,248 | 04/17/2013 | 709 | 2442 | 13-0401 (MBHB 15-517-CON) |

**APPLICANTS**
SONOS, INC., Santa Barbara, CA

**INVENTORS**
Nicholas A. J. Millington, Santa Barbara, CA;

**** CONTINUING DATA ***************************
This application is a CON of 13/297,000 11/15/2011 PAT 9182777
which is a CON of 10/816,217 04/01/2004 PAT 8234395
which claims benefit of 60/490,768 07/28/2003

**** FOREIGN APPLICATIONS ***************************

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05/21/2013

| Foreign Priority claimed ☐ Yes ☑ No<br>35 USC 119(a-d) conditions met ☐ Yes ☑ No<br>Verified and Acknowledged /OLEG SURVILLO/ Examiner's Signature | ☐ Met after Allowance<br>Initials | STATE OR COUNTRY | SHEETS DRAWINGS | TOTAL CLAIMS | INDEPENDENT CLAIMS |
|---|---|---|---|---|---|
| | | CA | 5 | 20 | 3 |

**ADDRESS**
McDonnell Boehnen Hulbert & Berghoff LLP
Sonos, Inc.
300 South Wacker Drive
Chicago, IL 60606
UNITED STATES

**TITLE**
METHOD AND APPARATUS FOR DYNAMIC MASTER DEVICE SWITCHING IN A SYNCHRONY GROUP

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| Search Notes | Application/Control No. | Applicant(s)/Patent Under Reexamination |
|---|---|---|
| | 13864248 | MILLINGTON, NICHOLAS A. J. |
| | Examiner | Art Unit |
| | OLEG SURVILLO | 2442 |

| CPC- SEARCHED | | |
|---|---|---|
| Symbol | Date | Examiner |
| G06F 3/167, 17/00, 17/3074, 3/048, 3/0482, 3/0484, 3/126, 3/16 | 9/6/2016 | OS |
| H04L 65/60, 12/2812 | 9/6/2016 | OS |

| CPC COMBINATION SETS - SEARCHED | | |
|---|---|---|
| Symbol | Date | Examiner |
| | | |

| US CLASSIFICATION SEARCHED | | | |
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| Class | Subclass | Date | Examiner |
| 709 | 219, 231 | 9/6/2016 | OS |

| SEARCH NOTES | | |
|---|---|---|
| Search Notes | Date | Examiner |
| Updated Inventor search | 9/6/2016 | OS |
| Updated Assignee search | 9/6/2016 | OS |
| Updated EAST search in USPAT, US-PGPUB, EPO, JPO, and FPRS databases | 9/6/2016 | OS |

| INTERFERENCE SEARCH | | | |
|---|---|---|---|
| US Class/ CPC Symbol | US Subclass / CPC Group | Date | Examiner |
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| | /OLEG SURVILLO/<br>Primary Examiner.Art Unit 2442 |

| Index of Claims | Application/Control No. | Applicant(s)/Patent Under Reexamination |
|---|---|---|
| | 13864248 | MILLINGTON, NICHOLAS A. J. |
| | Examiner | Art Unit |
| | OLEG SURVILLO | 2442 |

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| ✓ | Rejected | - | Cancelled | N | Non-Elected | A | Appeal |
| = | Allowed | ÷ | Restricted | I | Interference | O | Objected |

☐ Claims renumbered in the same order as presented by applicant ☐ CPA ☐ T.D. ☐ R.1.47

| CLAIM | | DATE | | | | | | | | |
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| | 25 | ✓ | | | | | | | | |
| | 26 | ✓ | | | | | | | | |
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| | 31 | ✓ | | | | | | | | |
| | 32 | ✓ | | | | | | | | |
| | 33 | ✓ | | | | | | | | |
| | 34 | ✓ | | | | | | | | |
| | 35 | ✓ | | | | | | | | |
| | 36 | ✓ | | | | | | | | |

| Index of Claims | Application/Control No. | Applicant(s)/Patent Under Reexamination |
|---|---|---|
| | 13864248 | MILLINGTON, NICHOLAS A. J. |
| | Examiner | Art Unit |
| | OLEG SURVILLO | 2442 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| ✓ | Rejected | - | Cancelled | N | Non-Elected | A | Appeal |
| = | Allowed | ÷ | Restricted | I | Interference | O | Objected |

☐ Claims renumbered in the same order as presented by applicant ☐ CPA ☐ T.D. ☐ R.1.47

| CLAIM | | DATE | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Final | Original | 09/01/2016 | | | | | | | | |
| | 37 | ✓ | | | | | | | | |
| | 38 | ✓ | | | | | | | | |
| | 39 | ✓ | | | | | | | | |
| | 40 | ✓ | | | | | | | | |

**EAST Search History**

**EAST Search History (Prior Art)**

| Ref # | Hits | Search Query | DBs | Default Operator | Plurals | Time Stamp |
|---|---|---|---|---|---|---|
| S1 | 9 | ("20020098878" \| "20020181355" \| "20030229900" \| "20040014426" \| "20040059965" \| "5185680" \| "5623483" \| "7310334" \| "7665115").PN. | US-PGPUB; USPAT | OR | ON | 2016/09/05 23:38 |
| S2 | 37 | ("20080002836" \| "20080072816" \| "20080077619" \| "20080077620" \| "20080086318" \| "20080189272" \| "20080263010" \| "20090089327" \| "20120185771" \| "20120192071" \| "20120207290" \| "20120281058" \| "20130031475" \| "20130041954" \| "20130052940" \| "20130070093" \| "20130094670" \| "20130124664" \| "20130132837" \| "20130159126" \| "20130179163" \| "20130208911" \| "20130208921" \| "20130226323" \| "20130232416" \| "20130253934" \| "20130287186" \| "20130290504" \| "20140298174" \| "20150019670" \| "20150304288" \| "6658091" \| "7996566" \| "8204890" \| "8285404" \| "8672744" \| "9160965").PN. | US-PGPUB; USPAT | OR | ON | 2016/09/05 23:53 |
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| S14 | 16 | ("20010042107" \| "20020022453" \| "20020026442" \| "20030073432" \| "20030157951" \| "20040019497" \| "20040024478" \| "5602992" \| "5923902" \| "6404811" \| "6522886" \| "7130616" \| "7136934" \| "7143939" \| "7236773" \| "7657910").PN. | US-PGPUB; USPAT | OR | ON | 2016/09/06 01:43 |
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| S16 | 3 | ("20020002565" \| "20020062406" \| "20100004983").PN. | US-PGPUB; USPAT | OR | ON | 2016/09/06 01:48 |
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| S18 | 26 | ("20020049843" \| "20020168938" \| "20020194309" \| "20030002609" \| "20030043924" \| "20040032348" \| "20040041836" \| "20040066736" \| "20040075767" \| "20040078383" \| "20050021590" \| "20060119497" \| "20070143493" \| "20070180137" \| "20080022320" \| "20120290621" \| "20130174100" \| "20130197682" \| "5956088" \| "7143141" \| "7574274" \| "7657644" \| "7676142" \| "8169938" \| "8290603" \| "8588949").PN. | US-PGPUB; USPAT | OR | ON | 2016/09/06 01:55 |
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| S20 | 131 | ("20010009604" \| "20010022823" \| "20010032188" \| "20020002039" \| "20020002562" \| "20020034374" \| "20020042844" \| "20020065926" \| "20020073228" \| "20020090914" \| "20020093478" \| "20020112244" \| "20020129156" \| "20020143998" \| "20020163361" \| "20020165921" \| "20030023741" \| "20030035444" \| "20030041173" \| "20030041174" \| "20030066094" \| "20030099212" \| "20030099221" \| "20030126211" \| "20030195964" \| "20030198257" \| "20030210796" \| "20030231871" \| "20040001484" \| "20040001591" \| "20040024925" \| "20040027166" \| "20040170383" \| "20040203378" \| "20040249965" \| "20040249982" \| "20040252400" \| "20050010691" \| "20050013394" \| "20050058149" \| "20050081213" \| "20050114538" \| "20050177643" \| "20050281255" \| "20050283820" \| "20050288805" \| "20070038999" \| "20070054680" \| "20070142944" \| "20070271388" \| "20080120429" \| "20090157905" \| "20090228919" \| "20120029671" \| "4296278" \| "4816989" \| "5182552" \| "5406634" \| "5440644" \| "5467342" \| "5491839" \| "5553222" \| "5668884" \| "5673323" \| "5815689" \| "5867691" \| "5875354" \| "5887143" \| "5946343" \| "6009457" \| "6026150" \| "6031818" \| "6128318" \| "6157957" \| "6175872" \| "6185737" \| "6195436" \| "6199169" \| "6256554" \| "6308207" \| "6324586" \| "6332147" \| "6351821" \| "6430353" \| "6487296" \| "6526325" \| "6587127" \| "6598172" \| "6611537" \| "6631410" \| "6674803" \| "6757517" \| "6778869" \| "6826283" \| "6836788" \| "6898642" \| "6912610" \| "6920373" \| "6934766" \| "6985694" \| "7007106" \| "7020791" \| "7043651" \| "7047308" \| "7115017" \| "7130608" \| "7162315" \| "7185090" \| "7187947" \| "7206367" \| "7209795" \| "7312785" \| "7324857" \| "7333519" \| "7372846" \| "7392102" \| "7643894" \| | US-PGPUB; USPAT | OR | ON | 2016/09/06 02:17 |

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| | | "7675943" \| "7720096" \| "7742740" \| "7934239" \| "8014423" \| "8045952" \| "8050652" \| "8074253" \| "8086752" \| "8103009" \| "8131390" \| "8234395" \| "8370678" \| "8423659").PN. | | | | |
| S21 | 50 | zone adj1 player and master.clm. | US-PGPUB; USPAT | OR | ON | 2016/09/06 02:23 |
| S22 | 6 | zone adj1 player and (master with slave).clm. | US-PGPUB; USPAT | OR | ON | 2016/09/06 02:23 |
| S23 | 2903 | G06F3/167.CPC. | US-PGPUB; USPAT | OR | ON | 2016/09/06 02:29 |
| S24 | 2861 | G06F17/00.CPC. | US-PGPUB; USPAT | OR | ON | 2016/09/06 02:29 |
| S25 | 512 | G06F17/3074.CPC. | US-PGPUB; USPAT | OR | ON | 2016/09/06 02:30 |
| S26 | 4181 | G06F3/048.CPC. | US-PGPUB; USPAT | OR | ON | 2016/09/06 02:30 |
| S27 | 15882 | G06F3/0482.CPC. | US-PGPUB; USPAT | OR | ON | 2016/09/06 02:30 |
| S28 | 6370 | G06F3/0484.CPC. | US-PGPUB; USPAT | OR | ON | 2016/09/06 02:30 |
| S29 | 1739 | G06F3/126.CPC. | US-PGPUB; USPAT | OR | ON | 2016/09/06 02:30 |
| S30 | 2012 | G06F3/16.CPC. | US-PGPUB; USPAT | OR | ON | 2016/09/06 02:30 |
| S31 | 2987 | H04L65/60.CPC. | US-PGPUB; USPAT | OR | ON | 2016/09/06 02:30 |
| S32 | 817 | H04L12/2812.CPC. | US-PGPUB; USPAT | OR | ON | 2016/09/06 02:30 |
| S33 | 15686 | 709/219.ccls. | US-PGPUB; USPAT | OR | ON | 2016/09/06 02:30 |
| S34 | 7652 | 709/231.ccls. | US-PGPUB; USPAT | OR | ON | 2016/09/06 02:30 |
| S35 | 1 | zone adj1 player and (overload$3).clm. | US-PGPUB; USPAT | OR | ON | 2016/09/06 02:49 |
| S36 | 3 | zone adj1 player and (disengag$3).clm. | US-PGPUB; USPAT | OR | ON | 2016/09/06 02:50 |
| S37 | 0 | zone adj1 player and (disengag$3).clm. | USPAT | OR | ON | 2016/09/06 02:51 |
| S38 | 0 | survillo and (disengag$3).clm. | USPAT | OR | ON | 2016/09/06 02:51 |

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|---|---|---|---|---|---|---|
| S39 | 83300 | (disengag$3).clm. | USPAT | OR | ON | 2016/09/06 02:51 |
| S40 | 240 | (disengag$3 with master).clm. | USPAT | OR | ON | 2016/09/06 02:51 |
| S41 | 0 | (disengag$3 with master with player).clm. | USPAT | OR | ON | 2016/09/06 02:51 |
| S42 | 9 | zone adj1 player and (multicast).clm. | USPAT | OR | ON | 2016/09/06 02:53 |
| S43 | 4 | zone adj1 player and (multicast adj1 address).clm. | USPAT | OR | ON | 2016/09/06 02:54 |
| S44 | 0 | zone adj1 player and (multicast adj1 address and network adj1 address).clm. | USPAT | OR | ON | 2016/09/06 02:56 |
| S45 | 5 | zone adj1 player and (network adj1 address).clm. | USPAT | OR | ON | 2016/09/06 02:56 |
| S46 | 5 | zone adj1 player and (network adj1 address with (send$3 or transmit$4)).clm. | USPAT | OR | ON | 2016/09/06 02:57 |
| S47 | 1 | "20070142944" | USPAT | OR | ON | 2016/09/06 02:59 |
| S48 | 0 | "20130231766" | USPAT | OR | ON | 2016/09/06 03:00 |
| S49 | 1 | "20130231766" | US-PGPUB; USPAT | OR | ON | 2016/09/06 03:00 |
| S50 | 2 | "20070142944" | US-PGPUB; USPAT | OR | ON | 2016/09/06 03:00 |
| S51 | 56496483 | @ad<"20040401" or @rlad<"20040401" | US-PGPUB; USPAT; FPRS; EPO; JPO | OR | ON | 2016/09/06 03:01 |
| S52 | 2 | "20070142944" and switch$3 with broadcast | US-PGPUB; USPAT | OR | ON | 2016/09/06 03:16 |
| S53 | 2 | "20070142944" and transfer$4 with broadcast | US-PGPUB; USPAT | OR | ON | 2016/09/06 03:17 |
| S54 | 9 | ("20020098878" \| "20020181355" \| "20030229900" \| "20040014426" \| "20040059965" \| "5185680" \| "5623483" \| "7310334" \| "7665115").PN. | US-PGPUB; USPAT | OR | ON | 2016/09/06 07:46 |
| S55 | 37 | ("20080002836" \| "20080072816" \| "20080077619" \| "20080077620" \| "20080086318" \| "20080189272" \| "20080263010" \| "20090089327" \| "20120185771" \| "20120192071" \| "20120207290" \| "20120281058" \| "20130031475" \| "20130041954" \| "20130052940" \| "20130070093" \| "20130094670" \| "20130124664" \| "20130132837" \| "20130159126" \| "20130179163" \| "20130208911" \| "20130208921" \| "20130226323" \| "20130232416" \| "20130253934" \| "20130287186" \| "20130290504" \| "20140298174" \| "20150019670" \| | US-PGPUB; USPAT | OR | ON | 2016/09/06 07:46 |

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|---|---|---|---|---|---|---|
| | | "20150304288" \| "6658091" \| "7996566" \| "8204890" \| "8285404" \| "8672744" \| "9160965").PN. | | | | |
| S56 | 19 | ("20020067909" \| "20040023697" \| "20050201549" \| "20060155721" \| "20070003067" \| "20070022207" \| "20070265031" \| "20080144864" \| "20080146289" \| "20100031366" \| "20110002487" \| "20120051567" \| "20130129122" \| "4696037" \| "5553147" \| "6809635" \| "6882335" \| "8934647" \| "8934655").PN. | US-PGPUB; USPAT | OR | ON | 2016/09/06 07:46 |
| S57 | 25 | ("20020103635" \| "20020136335" \| "20030097478" \| "20030135822" \| "20040019911" \| "20040111473" \| "20040128701" \| "20040179554" \| "20050125222" \| "20050198574" \| "20060041639" \| "20080025535" \| "5533021" \| "5652749" \| "6078725" \| "6163647" \| "6253293" \| "6349285" \| "6456783" \| "6763274" \| "6803964" \| "7058889" \| "7330875" \| "7359006" \| "7392481").PN. | US-PGPUB; USPAT | OR | ON | 2016/09/06 07:46 |
| S58 | 1 | ("20150139210").PN. | US-PGPUB; USPAT | OR | ON | 2016/09/06 07:46 |
| S59 | 111 | ("20080212786" \| "20080215169" \| "20090017868" \| "20090100189" \| "20090251604" \| "20110228944" \| "20120148075" \| "20120237054" \| "20130038726" \| "20130047084" \| "20130167029" \| "20130230175" \| "20130279706" \| "20140006483" \| "20140037097" \| "20140064501" \| "20140075308" \| "20140075311" \| "20140079242" \| "20140108929" \| "20140123005" \| "20140140530" \| "20140161265" \| "20140242913" \| "20140256260" \| "20140267148" \| "20140270202" \| "20140273859" \| "20140279889" \| "20140285313" \| "20140286496" \| "20140323036" \| "20140344689" \| "20140378056" \| "20150026613" \| "20150032844" \| "20150043736" \| "20150049248" \| "20150074527" \| "20150074528" \| "20150098576" \| "20150256954" \| "7158488" \| "7319764" \| "7474677" \| "7483540" \| "7509181" \| "7631119" \| "7669113" \| "7672470" \| "7689304" \| "7689305" \| "7765315" \| "7827259" \| "7958441" \| "8015306" \| "8045721" \| "8055364" \| "8090317" \| "8111132" \| "8116476" \| "8126172" \| "8144883" \| "8148622" \| "8170260" \| "8175297" \| "8185674" \| "8194874" \| "8208653" \| "8214447" \| "8214740" \| "8218790" \| "8233648" \| "8239748" \| "8279709" \| "8281001" \| "8300845" \| "8316147" \| "8325931" \| "8340330" \| "8345709" \| "8364295" \| "8407623" \| "8423893" \| "8432851" \| "8433076" \| "8457334" \| "8463184" \| "8463875" \| "8509211" \| | US-PGPUB; USPAT | OR | ON | 2016/09/06 07:46 |

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| | | "8520870" \| "8577048" \| "8611559" \| "8615091" \| "8639830" \| "8683009" \| "8731206" \| "8750282" \| "8751026" \| "8762565" \| "8818538" \| "8819554" \| "8843586" \| "8885851" \| "8904066" \| "8917877" \| "8930006" \| "8954177" \| "8965544" \| "8966394" \| "9137602").PN. | | | | |
| S60 | 1 | ("20030101253").PN. | US-PGPUB; USPAT | OR | ON | 2016/09/06 07:46 |
| S61 | 19 | ("20010047377" \| "20020159596" \| "20020165721" \| "20030219007" \| "20040012620" \| "20040048569" \| "20040080671" \| "20040224638" \| "20050015551" \| "20050131558" \| "20050166135" \| "20060193454" \| "6122668" \| "6449653" \| "6823225" \| "7068596" \| "7313593" \| "7702403" \| "RE41608").PN. | US-PGPUB; USPAT | OR | ON | 2016/09/06 07:46 |
| S62 | 18 | ("20020114359" \| "20030035072" \| "20030198254" \| "20030198255" \| "20030200001" \| "20040248601" \| "20060098936" \| "20070043847" \| "20100284389" \| "20100299639" \| "5726989" \| "5923869" \| "6108485" \| "6343028" \| "6687664" \| "6778493" \| "6970482" \| "7130368").PN. | US-PGPUB; USPAT | OR | ON | 2016/09/06 07:46 |
| S63 | 3 | ("20140181569" \| "5761320" \| "6535121").PN. | US-PGPUB; USPAT | OR | ON | 2016/09/06 07:46 |
| S64 | 9 | ("20020080783" \| "20020114354" \| "20030018797" \| "20030067437" \| "20040208158" \| "20040213230" \| "20040228367" \| "20130018960" \| "6816818").PN. | US-PGPUB; USPAT | OR | ON | 2016/09/06 07:46 |
| S65 | 8 | ("20010046235" \| "20020173273" \| "20040098754" \| "20050062637" \| "20130022221" \| "5153579" \| "7206967" \| "7711774").PN. | US-PGPUB; USPAT | OR | ON | 2016/09/06 07:46 |
| S66 | 19 | ("20020177411" \| "20030061428" \| "20030110329" \| "20040093096" \| "20040143368" \| "20040143852" \| "20040148237" \| "20050011388" \| "20050027821" \| "20050120128" \| "20050195823" \| "20070047712" \| "20070249295" \| "7483538" \| "7519667" \| "7606174" \| "7853341" \| "7996588" \| "8473844").PN. | US-PGPUB; USPAT | OR | ON | 2016/09/06 07:46 |
| S67 | 16 | ("20010042107" \| "20020022453" \| "20020026442" \| "20030073432" \| "20030157951" \| "20040019497" \| "20040024478" \| "5602992" \| "5923902" \| "6404811" \| "6522886" \| "7130616" \| "7136934" \| "7143939" \| "7236773" \| "7657910").PN. | US-PGPUB; USPAT | OR | ON | 2016/09/06 07:46 |
| S68 | 18 | ("20010027498" \| "20020184310" \| "20030055892" \| "20030204273" \| "20030204509" \| "20030227478" \| "20040133689" \| "20050216556" \| "20070192156" \| "20090193345" \| "20130197682" \| "5696896" \| "5787249" \| | US-PGPUB; USPAT | OR | ON | 2016/09/06 07:46 |

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|---|---|---|---|---|---|---|
| | | "6839752" \| "6907458" \| "7412499" \| "7743009" \| "8020023").PN. | | | | |
| S69 | 3 | ("20020002565" \| "20020062406" \| "20100004983").PN. | US-PGPUB; USPAT | OR | ON | 2016/09/06 07:46 |
| S70 | 3 | ("20020095460" \| "20050168630" \| "20080126943").PN. | US-PGPUB; USPAT | OR | ON | 2016/09/06 07:46 |
| S71 | 26 | ("20020049843" \| "20020168938" \| "20020194309" \| "20030002609" \| "20030043924" \| "20040032348" \| "20040041836" \| "20040066736" \| "20040075767" \| "20040078383" \| "20050021590" \| "20060119497" \| "20070143493" \| "20070180137" \| "20080022320" \| "20120290621" \| "20130174100" \| "20130197682" \| "5956088" \| "7143141" \| "7574274" \| "7657644" \| "7676142" \| "8169938" \| "8290603" \| "8588949").PN. | US-PGPUB; USPAT | OR | ON | 2016/09/06 07:46 |
| S72 | 64 | ("20020003548" \| "20020072816" \| "20020109710" \| "20020124097" \| "20020188762" \| "20030020763" \| "20030235304" \| "20040008852" \| "20040010727" \| "20040015252" \| "20040131192" \| "20050047605" \| "20050125357" \| "20050181348" \| "20050195205" \| "20050289224" \| "20060095516" \| "20060143236" \| "20070048713" \| "20070142022" \| "20070169115" \| "20070299778" \| "20080091771" \| "20080144861" \| "20090031336" \| "20090222115" \| "20100049835" \| "20100228740" \| "20110066943" \| "20120030366" \| "20120060046" \| "20120129446" \| "20130080599" \| "20130191454" \| "5239458" \| "5299266" \| "5751819" \| "5808662" \| "6108686" \| "6255961" \| "6349339" \| "7113999" \| "7218708" \| "7236739" \| "7293060" \| "7483958" \| "7571014" \| "7599685" \| "7657224" \| "7668990" \| "7669219" \| "7702279" \| "7835689" \| "7865137" \| "7885622" \| "7916877" \| "7917082" \| "8023663" \| "8028038" \| "8028323" \| "8112032" \| "8214873" \| "8230099" \| "8315555").PN. | US-PGPUB; USPAT | OR | ON | 2016/09/06 07:46 |
| S73 | 131 | ("20010009604" \| "20010022823" \| "20010032188" \| "20020002039" \| "20020002562" \| "20020034374" \| "20020042844" \| "20020065926" \| "20020073228" \| "20020090914" \| "20020093478" \| "20020112244" \| "20020129156" \| "20020143998" \| "20020163361" \| "20020165921" \| "20030023741" \| "20030035444" \| "20030041173" \| "20030041174" \| "20030066094" \| "20030099212" \| "20030099221" \| "20030126211" \| "20030195964" \| "20030198257" \| "20030210796" \| "20030231871" \| "20040001484" \| "20040001591" \| | US-PGPUB; USPAT | OR | ON | 2016/09/06 07:46 |

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| | | "20040024925" \| "20040027166" \| "20040170383" \| "20040203378" \| "20040249965" \| "20040249982" \| "20040252400" \| "20050010691" \| "20050013394" \| "20050058149" \| "20050081213" \| "20050114538" \| "20050177643" \| "20050281255" \| "20050283820" \| "20050288805" \| "20070038999" \| "20070054680" \| "20070142944" \| "20070271388" \| "20080120429" \| "20090157905" \| "20090228919" \| "20120029671" \| "4296278" \| "4816989" \| "5182552" \| "5406634" \| "5440644" \| "5467342" \| "5491839" \| "5553222" \| "5668884" \| "5673323" \| "5815689" \| "5867691" \| "5875354" \| "5887143" \| "5946343" \| "6009457" \| "6026150" \| "6031818" \| "6128318" \| "6157957" \| "6175872" \| "6185737" \| "6195436" \| "6199169" \| "6256554" \| "6308207" \| "6324586" \| "6332147" \| "6351821" \| "6430353" \| "6487296" \| "6526325" \| "6587127" \| "6598172" \| "6611537" \| "6631410" \| "6674803" \| "6757517" \| "6778869" \| "6826283" \| "6836788" \| "6898642" \| "6912610" \| "6920373" \| "6934766" \| "6985694" \| "7007106" \| "7020791" \| "7043651" \| "7047308" \| "7115017" \| "7130608" \| "7162315" \| "7185090" \| "7187947" \| "7206367" \| "7209795" \| "7312785" \| "7324857" \| "7333519" \| "7372846" \| "7392102" \| "7643894" \| "7675943" \| "7720096" \| "7742740" \| "7934239" \| "8014423" \| "8045952" \| "8050652" \| "8074253" \| "8086752" \| "8103009" \| "8131390" \| "8234395" \| "8370678" \| "8423659").PN. | | | | |
| S74 | 539 | S54 or S55 or S56 or S57 or S58 or S59 or S60 or S61 or S62 or S63 or S64 or S65 or S66 or S67 or S68 or S69 or S70 or S71 or S72 or S73 | US-PGPUB; USPAT | OR | ON | 2016/09/06 07:46 |
| S75 | 31 | S74 and overload$3 | US-PGPUB; USPAT | OR | ON | 2016/09/06 07:47 |
| S76 | 8 | S74 and overload$3 with master | US-PGPUB; USPAT | OR | ON | 2016/09/06 07:47 |
| S77 | 56496483 | @ad<"20040401" or @rlad<"20040401" | US-PGPUB; USPAT; FPRS; EPO; JPO | OR | ON | 2016/09/06 07:48 |
| S78 | 161 | S77 and overload$3 with master same (migrat$3 or switch$3 or leav$3 or disengag$3) | US-PGPUB; USPAT; FPRS; EPO; JPO | OR | ON | 2016/09/06 07:49 |
| S79 | 6 | S77 and overload$3 with master same (stream$3) | US-PGPUB; | OR | ON | 2016/09/06 07:50 |

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|---|---|---|---|---|---|---|
| | | | USPAT; FPRS; EPO; JPO | | | |
| S80 | 1 | S77 and overload$3 near3 master same (stream$3) | US-PGPUB; USPAT; FPRS; EPO; JPO | OR | ON | 2016/09/06 07:51 |
| S81 | 0 | S77 and determin$3 with overload$3 near3 master same (stream$3) same (migrat$3 or switch$3 or leav$3 or disengag$3) near4 master | US-PGPUB; USPAT; FPRS; EPO; JPO | OR | ON | 2016/09/06 07:52 |
| S82 | 0 | S77 and determin$3 with overload$3 near3 master same (migrat$3 or switch$3 or leav$3 or disengag$3) near4 master | US-PGPUB; USPAT; FPRS; EPO; JPO | OR | ON | 2016/09/06 07:52 |
| S83 | 0 | S77 and determin$3 with overload$3 near3 master same (migrat$3 or switch$3 or leav$3 or disengag$3) | US-PGPUB; USPAT; FPRS; EPO; JPO | OR | ON | 2016/09/06 07:53 |
| S84 | 0 | S77 and determin$3 with overload$3 near3 master | US-PGPUB; USPAT; FPRS; EPO; JPO | OR | ON | 2016/09/06 07:53 |
| S85 | 3 | S77 and determin$3 with overload$3 near3 (master or streaming near2 (device or server) or broadcaster) | US-PGPUB; USPAT; FPRS; EPO; JPO | OR | ON | 2016/09/06 07:54 |
| S86 | 7 | S77 and (determin$3 or detect$3) with overload$3 near3 (master or streaming near2 (device or server) or broadcaster) | US-PGPUB; USPAT; FPRS; EPO; JPO | OR | ON | 2016/09/06 07:56 |
| S87 | 3259 | S77 and (determin$3 or detect$3) with overload$3 same (migrat$3 or switch$3 or leav$3 or disengag$3) | US-PGPUB; USPAT; FPRS; EPO; JPO | OR | ON | 2016/09/06 07:58 |
| S88 | 2016 | S77 and (determin$3 or detect$3) near4 overload$3 same (migrat$3 or switch$3 or leav$3 or disengag$3) | US-PGPUB; USPAT; FPRS; EPO; JPO | OR | ON | 2016/09/06 07:58 |
| S89 | 23 | S77 and (determin$3 or detect$3) near4 overload$3 same (migrat$3 or switch$3 or | US-PGPUB; | OR | ON | 2016/09/06 07:59 |

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|---|---|---|---|---|---|---|
| | | leav$3 or disengag$3) same (stream$3 or broadcast$3) | USPAT; FPRS; EPO; JPO | | | |
| S90 | 1 | S77 and (determin$3 or detect$3) near4 overload$3 with peer same (migrat$3 or switch$3 or leav$3 or disengag$3) | US-PGPUB; USPAT; FPRS; EPO; JPO | OR | ON | 2016/09/06 08:03 |

**EAST Search History (Interference)**

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**9/6/2016 10:02:10 AM**
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Doc code: IDS
Doc description: Information Disclosure Statement (IDS) Filed

PTO/SB/08a (01-10)
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**( Not for submission under 37 CFR 1.99)**

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|---|---|
| Application Number | 13864248 |
| Filing Date | 2013-04-17 |
| First Named Inventor | Millington, Nicholas A. J. |
| Art Unit | 2442 |
| Examiner Name | SURVILLO, OLEG |
| Attorney Docket Number | SNS-71301.US.10 (13-0401) |

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| | 9 | "Non-Final Office Action mailed 30 July 2013 for U.S. Application No. 13/724048 filed 21 December 2012". | ☐ |
| | 10 | "Non-Final Rejection mailed on 20 August 2009 for U.S. Application No. 11/906,702 filed on 2 October 2007". | ☐ |
| | 11 | "Notice of Allowance mailed 06 March 2014 for U.S. Application No. 13/827653 filed 14 March 2013". | ☐ |
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| Attorney Docket Number | 13-0401 (MBHB 15-517-CON) |

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|---|---|---|---|---|---|---|---|---|
| | 1 | 2002358241 | JP | A | 2002-12-13 | VICTOR COMPANY OF JAPAN. | English Translation of Abstract only | |

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| | Examiner Name | SURVILLO, Oleg |
| | Attorney Docket Number | 13-0401 (MBHB 15-517-CON) |

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| Name/Print | Benjamin M. Urban | Registration Number | 71,591 |

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**Applicant(s):** VICTOR COMPANY OF JAPAN ± (VICTOR CO OF JAPAN LTD)

**Classification:** **- international:** ***G06F12/14; G06F21/24; G10K15/02; G11B20/10; G11B27/00;*** (IPC1-7): G06F12/14; G10K15/02; G11B20/10; G11B27/00

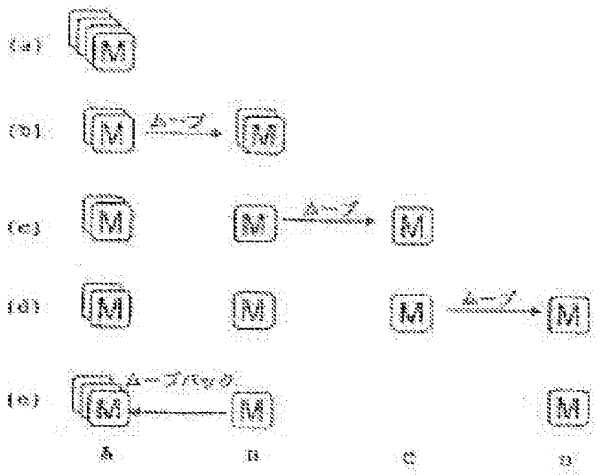
**- cooperative:**

**Application number:** JP20010165605 20010531

**Priority number(s):** JP20010165605 20010531

### Abstract of JP2002358241 (A)

PROBLEM TO BE SOLVED: To make the protection given to a copyright holder by SDMI(secure digital music initiative) regulations compatible with user's convenience in the copy management of content. SOLUTION: The content and a copying right number that the copy right holder gives to the user with respect to the content are distributed to the user as the virtual content files M of the number same as the copying right number, and, if the user copies from a medium with the distributed content to another medium, this case is treated as that the virtual content file is moved and the virtual content file of the move source is to be erased. By decrementing the copying right number of the medium of the copy source and by incrementing the copying right number of the medium of the copy destination, the virtual content file is treated as a movable object.



(19)日本国特許庁（ＪＰ）　(12)公開特許公報（Ａ）　(11)特許出願公開番号
特開2002－358241
（P2002－358241A）
(43)公開日　平成14年12月13日(2002.12.13)

| (51)Int.Cl.[7] | 識別記号 | ＦＩ | | テーマコード（参考） |
|---|---|---|---|---|
| Ｇ０６Ｆ　12/14 | ３２０ | Ｇ０６Ｆ　12/14 | ３２０Ｅ | ５Ｂ０１７ |
| Ｇ１０Ｋ　15/02 | | Ｇ１０Ｋ　15/02 | | ５Ｄ０４４ |
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| | | | Ｈ | |
| 27/00 | | 27/00 | Ｂ | |

審査請求　未請求　請求項の数８　ＯＬ　（全　８　頁）

(21)出願番号　特願2001－165605(P2001－165605)

(22)出願日　平成13年５月31日(2001.5.31)

(71)出願人　000004329
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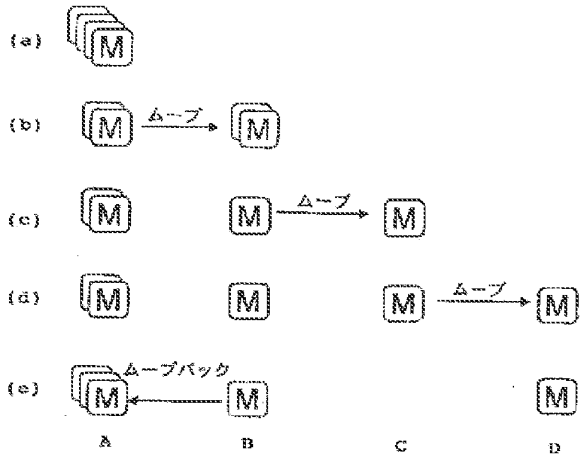
最終頁に続く

(54)【発明の名称】　コンテンツのコピー管理方法、記録再生装置及び再生装置

(57)【要約】

【課題】　コンテンツのコピー管理において、ＳＤＭＩ規則で著作権者に与えている保護とユーザの利便性を両立させる。

【解決手段】　コンテンツ及びそのコンテンツに対して著作権者からユーザに与えるコピー権利数を、コピー権利数と同じ数の仮想コンテンツファイルＭとしてユーザに配信し、ユーザが配信コンテンツを媒体から媒体にコピーする場合に、仮想コンテンツファイルを移動して移動元の仮想コンテンツファイルを消去するものとして取り扱う。コピー元の媒体のコピー権利数をデクリメントし、コピー先の媒体のコピー権利数をインクリメントすることにより、仮想コンテンツファイルを移動するものとして取り扱う。



【特許請求の範囲】
【請求項１】　コンテンツ及びそのコンテンツに対して著作権者からユーザに与えるコピー権利数を、コピー権利数と同じ数の仮想コンテンツファイルとしてユーザに配信するステップと、
ユーザが前記コンテンツを媒体から媒体にコピーする場合に、前記仮想コンテンツファイルを移動して移動元の媒体の仮想コンテンツファイルを消去するステップとを、
有するコンテンツのコピー管理方法。
【請求項２】　コンテンツをそのコンテンツに対して著作権者からユーザに与えるコピー権利数と共にユーザに配信するステップと、
ユーザが前記配信されたコンテンツを媒体から媒体にコピーする場合に、前記コンテンツ及びコピー権利数をコピー権利数と同じ数の仮想コンテンツファイルとして移動して移動元の仮想コンテンツファイルを消去するステップとを、
有するコンテンツのコピー管理方法。
【請求項３】　コピー元の媒体のコピー権利数をデクリメントし、コピー先の媒体のコピー権利数をインクリメントすることにより、前記仮想コンテンツファイルを移動することを特徴とする請求項１又は２に記載のコンテンツのコピー管理方法。
【請求項４】　１つの配信コンテンツを、著作権者からユーザに与えるコピー権利数と同じ数の仮想コンテンツファイルとして媒体から媒体に移動し、移動元の媒体の仮想コンテンツファイルを消去するコンテンツ配信システムにおいて前記コンテンツを記録再生する装置であって、
前記仮想コンテンツファイルの移動方向及び移動数に応じてコピー権利数をデクリメント又はインクリメントすることを特徴とする記録再生装置。
【請求項５】　請求項４に記載の前記記録再生装置は、ユーザが配信コンテンツを受信して他の媒体にコピーするためのサーバであることを特徴とする記録再生装置。
【請求項６】　請求項４に記載の前記記録再生装置は、ポータブルメディアであることを特徴とする記録再生装置。
【請求項７】　請求項４に記載の前記記録再生装置は、光ディスク記録再生装置であることを特徴とする記録再生装置。
【請求項８】　１つの配信コンテンツを、著作権者からユーザに与えるコピー権利数と同じ数の仮想コンテンツファイルとして媒体から媒体に移動し、移動元の媒体の仮想コンテンツファイルを消去するコンテンツ配信システムにおいて前記コンテンツを再生する装置であって、コピー権利数が０の場合に仮想コンテンツファイルのコンテンツを再生しないことを特徴とする再生装置。
【発明の詳細な説明】
【０００１】
【発明の属する技術分野】本発明は、ユーザが音楽などのコンテンツを媒体から媒体にコピーする場合にそのコピーを管理するためのコンテンツのコピー管理方法、記録再生装置及び再生装置に関する。
【０００２】
【従来の技術】例えば電子音楽配信システムにおいて配信されたコンテンツをユーザが媒体から媒体へコピーする場合、コンテンツプロバイダ側の著作権を守る方法としてＳＤＭＩ（Secure Digital Music Initiatuve）のガイドラインにより幾つかの取り決めが規定されている。この取り決めでは、コンテンツプロバイダ側でコンテンツに対してチェックアウト・イン数をあらかじめ設定してユーザに配信し、ユーザが配信コンテンツをパーソナルコンピュータ（ＰＣ）を用いて受信してＰＣ内の記録メディア（例えばＨＤ）に記録し、このＨＤを親（サーバ）として扱う。
【０００３】また、ユーザはそのＰＣを用いて配信コンテンツを再生するだけではなく、設定チェックアウト・イン数だけＰＣからポータブル装置（ＰＤ）やポータブルメディア（ＰＭ）にチェックアウトしてコピーし、これを再生することができる。この場合、チェックアウト毎に設定数がデクリメントされ、チェックアウト数は設定数の範囲内に限定される。また、ユーザはＰＤやＰＭで不要になったコンテンツをＰＣに戻してチェックアウト数を増やす（チェックインする）ことができる。
【０００４】図７を参照して詳しく説明する。なお、図７はチェックアウト・イン数＝３の場合を示している。Ｐ１、Ｐ２はそれぞれ上記のＰＣ（ＨＤ）である親を示し、それぞれ３つのＣ１、Ｃ２は、親Ｐ１、Ｐ２からチェックアウトされた子を示す。ＳＤＭＩでは、チェックアウトされた子Ｃ１、Ｃ２からは、他の媒体には移動もコピーもすることができず、また、他の親にはチェックインすることができないように規定されている。
【０００５】さらに、チェックアウトを行うコピー先のＰＤやＰＭについては、著作権保護を確保するためにＳＤＭＩの取り決めに準拠しているか否かをコピー元とコピー先の間で認証（Authentification）を行い、著作権保護が確保されない装置にはコピーを許可しないことが取り決められている。認証に合格してチェックアウトされた音楽は、元のＰＣに返却（チェックイン）することにより当該音楽の著作権を管理可能にするとともに、ＰＤやＰＭの限られた記録容量で他の音楽を記録可能にしている。また、ＳＤＭＩでは、コンテンツ自体をコピーではなく、全ての権利と共に「移動」することも可能である。この場合にはコピーではなく移動であるので、移動元のコンテンツは削除される。
【０００６】
【発明が解決しようとする課題】しかしながら、上記のようにチェックアウト／チェックインによりコピー先な

どを管理する方法では、ユーザにとってチェックインの際の戻し先（親Ｐ１、Ｐ２）が固定であり、また、子から他のメディアに移動することができないので不便であるという問題点がある。

【０００７】また、ＳＤＭＩは子ＣのＰＭとして記録容量の比較的少ないフラッシュメモリなどのみを想定し、図８に示すように記録再生用のＤＶＤなどのポータブル、大容量の光ディスク６を子として想定していないので、例えばＰＭ５の代表例であるメモリカードなどの子から光ディスク６へのコピー、移動ができず、このため、ユーザが光ディスク６上で多くの配信音楽を管理することができず、不便である。

【０００８】また、大容量の光ディスク６は、コピー経路を考慮すると、親Ｐとしても子Ｃとしてもなり得るので、親Ｐの権利を有する音楽と子Ｃの権利を有する音楽が同居することが考えられるが、この場合にはユーザにとってその区別が分かりづらい。このため、光ディスク６上の音楽をチェックアウトしようとしても、それが子Ｃであればチェックアウトすることができず、また、光ディスク６にチェックインしようとしても、どの光ディスク６が親Ｐであったかがわからない場合が出てくる。

【０００９】また、ＳＤＭＩはユーザが１台のＰＣ１を使用することを想定しているので、ユーザが複数台のＰＣを使用している場合にはチェックイン先のＰＣがわからない場合が出てくる。さらに、このようにユーザにとって不便であると、音楽の販売業者（コンテンツプロバイダ）にとって、チェックアウトに対する販売価格がユーザの理解を得ることができなくなるという問題点がある。

【００１０】本発明は上記の問題点に鑑み、ＳＤＭＩ規則で著作権者に与えている保護とユーザの利便性を両立させることができるコンテンツのコピー管理方法、記録再生装置及び再生装置を提供することを目的とする。

【００１１】

【課題を解決するための手段】本発明は上記目的を達成するために、１つの配信コンテンツを、著作権者からユーザに与えるコピー権利数と同じ数の仮想コンテンツファイルとして移動し、移動元の媒体の仮想コンテンツファイルを消去するようにしたものである。すなわち本発明によれば、コンテンツ及びそのコンテンツに対して著作権者からユーザに与えるコピー権利数を、コピー権利数と同じ数の仮想コンテンツファイルとしてユーザに配信するステップと、ユーザが前記コンテンツを媒体から媒体にコピーする場合に、前記仮想コンテンツファイルを移動して移動元の媒体の仮想コンテンツファイルを消去するステップとを、有するコンテンツのコピー管理方法が提供される。

【００１２】上記方法により、移動という処理により移動元の仮想コンテンツファイルは消去されるので、１つの配信コンテンツがコピーされる媒体の数は、常に著作権者からユーザに与えるコピー権利数以下となり、したがって、ＳＤＭＩ規則で著作権者に与えている保護と同等の保護を実現することができる。また、ユーザは現在コピーされている媒体の数をコピー権利数以下とする条件下で、コンテンツを任意の媒体から任意の媒体にコピーすることができるので、ユーザの利便性を向上させることができる。

【００１３】

【発明の実施の形態】以下、図面を参照して本発明の実施の形態について説明する。図１は本発明に係るコピー管理方法の一実施形態を示す説明図、図２は図１のコピー管理方法によるコピー形態を示す説明図、図３は図１のコピー管理方法による配信コンテンツのデータ構造を示す説明図である。

【００１４】本発明では、ＳＤＭＩに定められているチェックアウト数でコンテンツのコピー数を許可する代わりに、著作権者側からユーザに許可するコピー権利数（コピー媒体の数）と同じ数の仮想ファイルを想定することにより、コンテンツを「コピー」するのではなく仮想ファイルを「移動（ムーブ）」する。すなわち、コンテンツプロバイダからユーザに対しては、例えば１つのコンテンツと権利数＝４が配信されるが、同じコンテンツの４つの仮想的なファイルとして配信される。そして、ユーザが媒体から媒体へコピーする場合には、実コンテンツがコピーされるものとは取り扱わず、コピー元では権利数カウンタをデクリメントし、コピー先では権利数カウンタをインクリメントすることにより仮想的なファイルが移動されるものとして取り扱う。このため、権利数＝１のコンテンツをコピーする場合には１つの仮想ファイルが移動されることになり、コピー元では仮想ファイルは消去され（権利数は０）、再生も移動も不可となる。

【００１５】図１（ａ）は権利数＝４のコンテンツが媒体Ａに配信されて、媒体Ａには４つの仮想ファイルＭが記録されていることを示している。図１（ｂ）は図１（ａ）の状態から、媒体Ａに配信された権利数＝４のコンテンツの内、権利数＝２のコンテンツを媒体Ｂにコピーする場合を示し、この場合には２つの仮想ファイルＭが媒体Ａから媒体Ｂに移動（ムーブ）する（移動するものとして取り扱う。以下同じ）。この２つの仮想ファイルＭの移動の結果、媒体Ａ、Ｂには共に２つの仮想ファイルＭ（権利数＝２のコンテンツ）が記録される。図１（ｃ）は図１（ｂ）の状態から、媒体Ｂに移動された権利数＝２のコンテンツの内、権利数＝１のコンテンツを媒体Ｃにコピーする場合を示し、この場合には１つの仮想ファイルＭが媒体Ｂから媒体Ｃに移動する。この１つの仮想ファイルＭの移動の結果、媒体Ｂ、Ｃには共に１つの仮想ファイルＭ（権利数＝１のコンテンツ）が記録される。

【００１６】図１（ｄ）は、図１（ｃ）の状態から、媒

体Ｃに移動された権利数＝１のコンテンツを媒体Ｄにコピーする場合を示し、１つの仮想ファイルＭが媒体Ｃから媒体Ｄに移動する。この１つの仮想ファイルＭの移動の結果、媒体Ｃは権利数＝０となって仮想ファイルＭが０となり、消去されるか又は再生も移動も不可となる。図１（ｅ）は図１（ｄ）の状態から、図１（ｂ）において媒体Ａから媒体Ｂに移動された権利数＝１のコンテンツを媒体Ａに戻す場合（ムーブバック）を示し、この仮想ファイルＭの移動の結果、媒体Ａは権利数＝３（３つの仮想ファイルＭ）となり、媒体Ｂは権利数＝０（仮想ファイルＭは０）となって消去されるか又は再生も移動も不可となる。

【００１７】上記の媒体Ａ～Ｄを搭載した機器、又は媒体Ａ～Ｄ自身は、コンテンツをコピーする場合、すなわち仮想ファイルＭを移動する場合には、お互いにＳＤＭＩ規則に従って権利確認を行う機器であることを認証し、認証結果がＯＫの場合にのみ受け渡しを行う。ここで、権利を管理する情報の具体的、詳細な内容はＳＤＭＩ規則により定められていないので、本発明はＳＤＭＩ規則を遵守している。

【００１８】図２はユーザが仮想ファイルＭを移動する形態を示している。ＰＣ１は不図示のインターネットを介してコンテンツプロバイダの大容量サーバから配信される権利管理情報が伴う楽曲を受信して、ＨＤＤ内のＨＤに記録することができる。権利管理情報は上記の権利数Ｎを含み、権利数Ｎは著作権者が一方的に決定したり、また、例えばＮ＝１～４のように限定してユーザが支払う対価に応じて異なるように決定することができる。

【００１９】有料で購入されるコンテンツは、著作権者により管理されないコピーを防ぐために暗号化されており、ユーザはコンテンツ購入時に暗号を解くための鍵を受け取る。また、権利数Ｎのデータは、一般ユーザが改ざんできない領域に配置される。ＰＣ１を介してコンテンツを受け取るユーザは、現在のコピー媒体の数が権利数Ｎの範囲内である条件下で、ＰＣ１内のＨＤに記録してＨＤからフラッシュメモリなどのＰＭ５や光ディスク６にコピー（仮想ファイルを移動）することができ、また、ＰＭ５や光ディスク６から他の媒体に再コピー、さらには再々コピー～することができる。

【００２０】図２において、また、携帯電話機２もＰＣ１と同様に、不図示の基地局を介してサーバから配信される権利管理情報が伴う楽曲を受信して、ＰＤとして内部メモリに記録したり、ＰＭ５などに記録することができる。記録・再生装置３はフラッシュメモリなどのＰＭ５の差し込み口と光ディスク６のドライブを備え、権利数Ｎの範囲内でＰＭ５と光ディスク６の間で双方向にコピー、再コピーすることができる。ポータブル型記録・再生装置４はフラッシュメモリなどのＰＭ５の差し込み口を備え、ＰＭ５にコピーされたコンテンツを再生することができる。これらの装置１～４の間では、ＰＭ５や光ディスク６を移動させて再生することができる。また、ＰＣ１と記録・再生装置３、４の間では、媒体の移動の代わりに、仮想ファイルＭを無線や有線のデジタルインタフェースを介して転送するように構成することもできる。

【００２１】図３は１曲分（１つの実コンテンツファイル）の配信データの構造例を示している。配信データは先頭のヘッダと、ヘッダ以下に続く権利管理情報、曲名や歌詞、静止画などの補助データ、及び音楽そのものの主データなどの各ブロックにより構成されている。ヘッダはファイル名と、ヘッダ以下の各ブロックの先頭アドレス及びデータサイズなどを含む。権利管理情報はコンテンツ名、コンテンツＩＤ、権利数Ｎ（１バイト）、チェックアウト・イン権利数（１バイト）、チェックアウト・イン管理情報（１００バイト）などを含む。

【００２２】ここで、本発明によれば、ＳＤＭＩのチェックアウト・インによりコピーを管理しないので、上記のチェックアウト・イン権利数とチェックアウト・イン管理情報は必ずしも必要はない。しかし、今後の普及を考えると、ＳＤＭＩのチェックアウト・インによる配信システムと、本発明による配信システムが共存するかもしれないので、上記のデータ構造によれば、前者のシステムにも対応することができる。

【００２３】さらに、本発明によれば、上記の権利数Ｎを含まずチェックアウト・イン権利数のみを含むデータ構造であっても、チェックアウト・イン権利数を権利数Ｎに換算することにより対応することができる。すなわち、チェックアウト・インのシステムは戻し先を限定するものであり、他方、本発明のシステムは戻し先を限定しないので、チェックアウト・イン権利数＝１、２をＮ＝１に換算し、チェックアウト・イン権利数＝３、４をＮ＝２に換算して対応することができる。また、著作権者がいずれかのシステムを選択可能にすることもできる。この場合にはシステム選択フラグをデータ構造内に設けることにより対応することができる。

【００２４】＜記録装置／再生装置＞図４は本発明の一実施形態として、図２に示した記録・再生装置３を詳しく示している。図４において、エンコード／デコード部１１は操作部１２から記録コマンドを受け取ると、音声入力部１３を介して音声データを入力し、また、静止画入力があればこれを画像入力部１４を介して入力し、次いで各入力データをエンコードしてそのストリームをディスクＤやフラッシュメモリＦＭに記録する。このとき、各入力データは編集部１５を介して編集することができる。また、エンコード／デコード部１１は操作部１２から再生コマンドを受け取ると、ディスクＤやフラッシュメモリＦＭからストリームを読み出してデコードし、次いでデコードした音声データは音声出力部１６を介して、また、静止画データは画像出力部１７を介して

出力する。

【００２５】図５、図６は、電子音楽配信された装置の媒体（例えば図２に示すＰＣ１内のディスク）から、例えば記録・再生装置３の光ディスク６にコピー（仮想ファイル移動）処理を示している。まず、ユーザが送出機（ＰＣ１）側でコンテンツの名称と権利数Ｎを確認し、ムーブする権利数を設定する（ステップＳ１）。そして、その設定によりコピー元の権利数が０になる場合には注意喚起のメッセージ、例えば「このＰＣでは再生できなくなりますが、このまま処理を続けますか」とＯＫ／ＮＯボタンを表示する（ステップＳ２）。そして、ステップＳ３においてＯＫボタンがクリックされればステップＳ４以下に進み、他方、ＮＯボタンがクリックされればステップＳ１に戻る。

【００２６】ステップＳ４以下では、まず、コピー元と行先（コピー先）の間でコピー先のレコーダ及びディスクがＳＤＭＩの取り決めに準拠しているか否かを認証し（ステップＳ４）、ステップＳ５において認証がＯＫでなければステップＳ６に分岐して認証不成立を表示し、この処理を終了する。他方、認証がＯＫであればステップＳ７に進み、記録スタートボタンが押下されると、図３に示すデータ構造のコンテンツの送出側再生と行先の記録を開始する。

【００２７】次いで、図３に示すデータ構造のコンテンツの送出側再生と行先の記録を終了すると、送出側ディスクの権利管理情報は元のままとし、記録側ディスクの権利管理情報は未記録とし（ステップＳ８）、次いで送出側と記録側の装置を共に操作禁止モードに設定する（ステップＳ９）。次いで記録側ディスクに新しい権利管理情報を記録してベリファイする（ステップＳ１０）。このとき、記録側ディスクに記録されているコンテンツの一覧表を作成して記録することにより、ディスク上のランダムなエリアに記録されている多数の楽曲を容易に管理することができる。

【００２８】ステップＳ１１においてベリファイ結果がＯＫの場合にはステップＳ１２に進み、他方、ＮＯの場合にはステップＳ１４に分岐する。ステップＳ１２では再生側ディスクの権利管理情報の権利数Ｎを移動数に応じて減算して書き換え、これをベリファイする。そして、ステップＳ１３においてベリファイ結果がＯＫの場合にはステップＳ１５に進み、他方、ＮＯの場合にはステップＳ１４に分岐する。ステップＳ１４では記録側ディスクの当該コンテンツの権利管理情報を消去して使用不能にし、次いでステップＳ１５に進む。ステップＳ１５ではステップＳ１３、Ｓ１４の処理結果をユーザに知らせ、次いで操作禁止モードを解除し（ステップＳ１６）、次いでこのコピー処理を終了する。

【００２９】

【発明の効果】以上説明したように本発明によれば、１つの配信コンテンツを、著作権者からユーザに与えるコピー権利数と同じ数の仮想コンテンツファイルとして移動し、移動元の仮想コンテンツファイルを消去するようにしたので、１つの配信コンテンツがコピーされる媒体の数は、常に著作権者からユーザに与えるコピー権利数以下となり、したがって、ＳＤＭＩ規則で著作権者に与えている保護と同等の保護を実現することができる。また、ユーザは現在コピーされている媒体の数をコピー権利数以下とする条件下でコンテンツを任意の媒体から任意の媒体にコピーすることができるので、ユーザの利便性を向上させることができる。

【図面の簡単な説明】

【図１】本発明に係るコピー管理方法の一実施形態を示す説明図である。

【図２】図１のコピー管理方法によるコピー形態を示す説明図である。

【図３】図１のコピー管理方法による配信コンテンツのデータ構造を示す説明図である。

【図４】本発明に係る光ディスク記録再生装置を示すブロック図である。

【図５】本発明に係るコピー管理方法によるコピー処理を説明するためのフローチャートである。

【図６】本発明に係るコピー管理方法によるコピー処理を説明するためのフローチャートである。

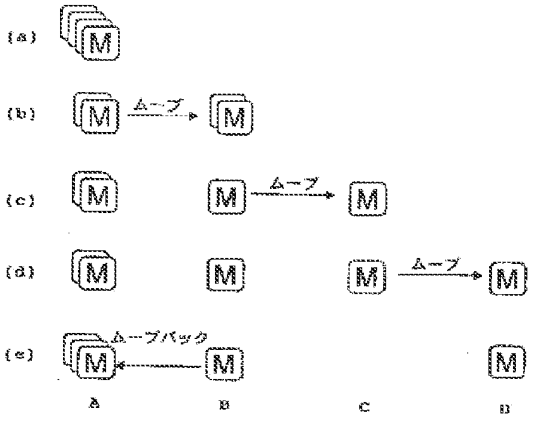
【図７】従来例としてＳＤＭＩによるコピー管理方法を示す説明図である。

【図８】図７のコピー管理方法によるコピー形態を示す説明図である。

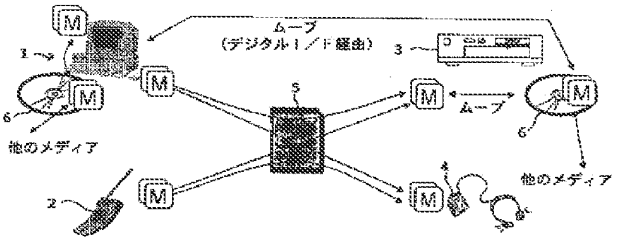
【符号の説明】

Ｍ　仮想ファイル

【図１】




【図２】

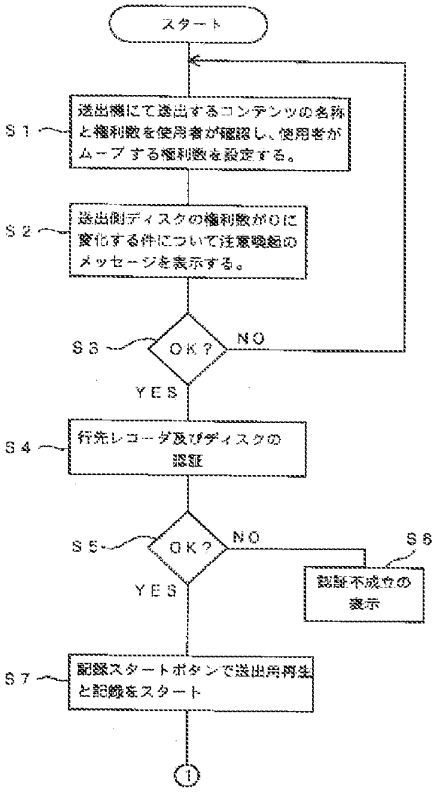



【図３】

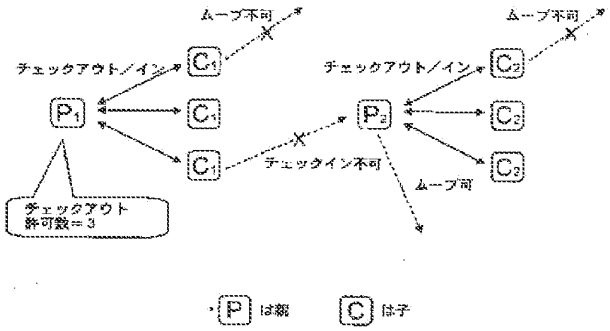
データ構造（１曲分：実ファイル）

| |
|---|
| ヘッダ　（ファイル名、下記ブロックのアドレスとサイズ） |
| 権利管理情報<br>・コンテンツ名、ＩＤ<br>・権利数（１バイト割当て）<br>・チェックアウトイン権利数（１バイト割当て）<br>・チェックアウトイン管理情報（１００バイト割当て） |
| 補助データ<br>・曲名、歌詞、静止画・・・ |
| 主データ<br>・楽曲 |

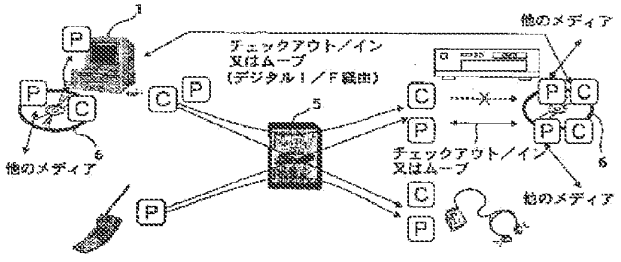
【図５】



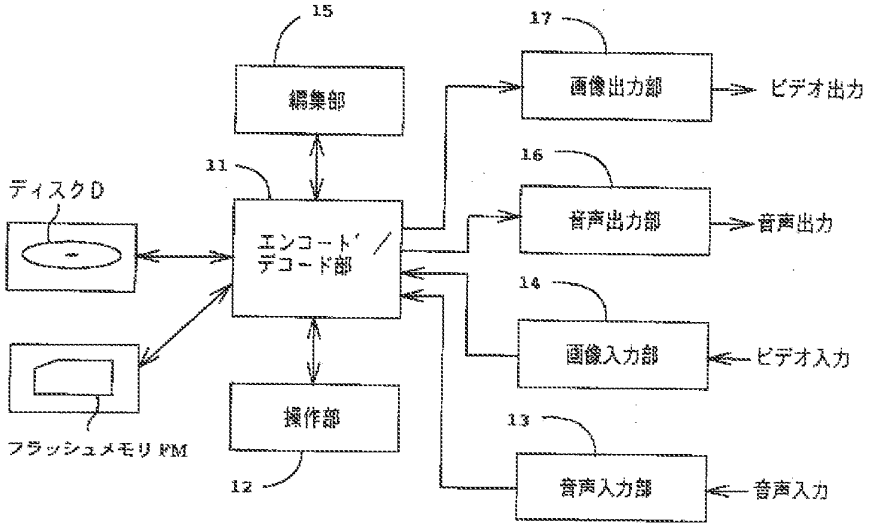

【図７】



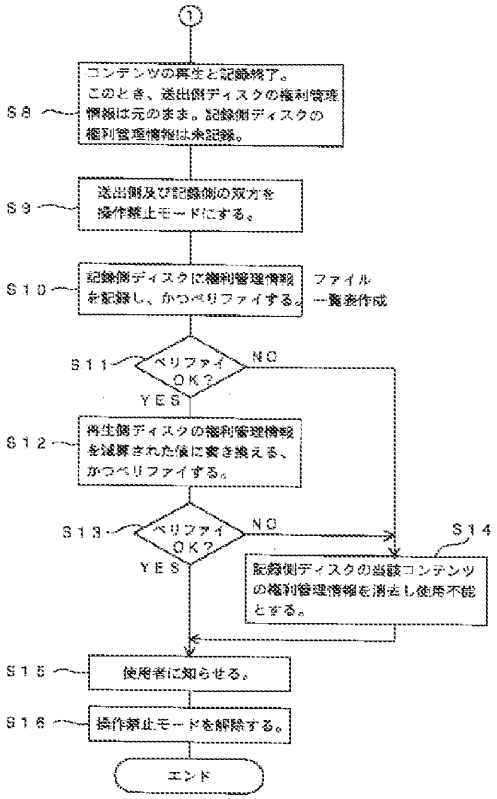

【図８】



【図４】


15
編集部
17
画像出力部
ビデオ出力
11
ディスクD
エンコード／デコード部
16
音声出力部
音声出力
14
画像入力部
ビデオ入力
操作部
13
音声入力部
音声入力
フラッシュメモリ FM
12

【図６】


①
コンテンツの再生と記録終了。
このとき、送出側ディスクの権利管理情報は元のまま。記録側ディスクの権利管理情報は未記録。
S8
送出側及び記録側の双方を操作禁止モードにする。
S9
記録側ディスクに権利管理情報を記録し、かつベリファイする。
ファイル一覧表作成
S10
ベリファイOK?
S11
NO
YES
再生側ディスクの権利管理情報を減算された後に書き換える、かつベリファイする。
S12
ベリファイOK?
S13
NO
YES
S14
記録側ディスクの当該コンテンツの権利管理情報を消去し使用不能とする。
使用者に知らせる。
S15
操作禁止モードを解除する。
S16
エンド

Ｆターム(参考)　5B017 AA06 BA08 BB10 CA16
5D044 AB06 AB08 BC01 BC04 CC04
DE29 DE50 DE54 EF05 GK12
HL02 HL07
5D110 AA13 AA17 AA27 AA29 BB29
DA04 DA11 DB03 DB09 DC05
DC16 DD05 DD13 DE01

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|---|---|
| **EFS ID:** | 26278391 |
| **Application Number:** | 13864248 |
| **International Application Number:** | |
| **Confirmation Number:** | 5095 |
| **Title of Invention:** | SYSTEM AND METHOD FOR SYNCHRONIZING OPERATIONS AMONG A PLURALITY OF INDEPENDENTLY CLOCKED DIGITAL DATA PROCESSING DEVICES |
| **First Named Inventor/Applicant Name:** | Nicholas A. J. Millington |
| **Customer Number:** | 107361 |
| **Filer:** | Benjamin Michael Urban |
| **Filer Authorized By:** | |
| **Attorney Docket Number:** | 13-0401 (MBHB 15-517-CON) |
| **Receipt Date:** | 07-JUL-2016 |
| **Filing Date:** | 17-APR-2013 |
| **Time Stamp:** | 17:42:39 |
| **Application Type:** | Utility under 35 USC 111(a) |

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**Warnings:**

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| Application Number | 13864248 |
| Filing Date | 2013-04-17 |
| First Named Inventor | MILLINGTON; Nicholas A.J. |
| Art Unit | 2442 |
| Examiner Name | SURVILLO, Oleg |
| Attorney Docket Number | 13-0401 (MBHB 15-517-CON) |

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| | Attorney Docket Number | 13-0401 (MBHB 15-517-CON) |

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| | Filing Date | 2013-04-17 |
| | First Named Inventor | MILLINGTON; Nicholas A.J. |
| | Art Unit | 2442 |
| | Examiner Name | SURVILLO, Oleg |
| | Attorney Docket Number | 13-0401 (MBHB 15-517-CON) |

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| | 6 | Notice of Allowance mailed on 07 April 2016, issued in connection with U.S. Patent Application No. 13/533105, filed on 26 June 2012, 40 pages. | |
| | 7 | Notice of Allowance mailed on 11 April 2016, issued in connection with U.S. Patent Application No. 13/864247, filed on 17 April 2013, 21 pages. | |

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**EXAMINER SIGNATURE**

| Examiner Signature | | Date Considered | |
|---|---|---|---|

*EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through a citation if not in conformance and not considered. Include copy of this form with next communication to applicant.

[1] See Kind Codes of USPTO Patent Documents at www.USPTO.GOV or MPEP 901.04. [2] Enter office that issued the document, by the two-letter code (WIPO Standard ST.3). [3] For Japanese patent documents, the indication of the year of the reign of the Emperor must precede the serial number of the patent document. [4] Kind of document by the appropriate symbols as indicated on the document under WIPO Standard ST.16 if possible. [5] Applicant is to place a check mark here if English language translation is attached.

| INFORMATION DISCLOSURE STATEMENT BY APPLICANT ( Not for submission under 37 CFR 1.99) | | |
|---|---|---|
| | Application Number | 13864248 |
| | Filing Date | 2013-04-17 |
| | First Named Inventor | MILLINGTON; Nicholas A.J. |
| | Art Unit | 2442 |
| | Examiner Name | SURVILLO, Oleg |
| | Attorney Docket Number | 13-0401 (MBHB 15-517-CON) |

**CERTIFICATION STATEMENT**

Please see 37 CFR 1.97 and 1.98 to make the appropriate selection(s):

That each item of information contained in the information disclosure statement was first cited in any communication from a foreign patent office in a counterpart foreign application not more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(1).

**OR**

☐ That no item of information contained in the information disclosure statement was cited in a communication from a foreign patent office in a counterpart foreign application, and, to the knowledge of the person signing the certification after making reasonable inquiry, no item of information contained in the information disclosure statement was known to any individual designated in 37 CFR 1.56(c) more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(2).

See attached certification statement.

The fee set forth in 37 CFR 1.17 (p) has been submitted herewith.

☒ A certification statement is not submitted herewith.

**SIGNATURE**

A signature of the applicant or representative is required in accordance with CFR 1.33, 10.18. Please see CFR 1.4(d) for the form of the signature.

| Signature | /Benjamin M. Urban/ | Date (YYYY-MM-DD) | 2016-05-20 |
|---|---|---|---|
| Name/Print | Benjamin M. Urban | Registration Number | 71,591 |

This collection of information is required by 37 CFR 1.97 and 1.98. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 1 hour to complete, including gathering, preparing and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

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2. A record from this system of records may be disclosed, as a routine use, in the course of presenting evidence to a court, magistrate, or administrative tribunal, including disclosures to opposing counsel in the course of settlement negotiations.

3. A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.

4. A record in this system of records may be disclosed, as a routine use, to a contractor of the Agency having need for the information in order to perform a contract. Recipients of information shall be required to comply with the requirements of the Privacy Act of 1974, as amended, pursuant to 5 U.S.C. 552a(m).

5. A record related to an International Application filed under the Patent Cooperation Treaty in this system of records may be disclosed, as a routine use, to the International Bureau of the World Intellectual Property Organization, pursuant to the Patent Cooperation Treaty.

6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).

7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (i.e., GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.

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9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

Espacenet

## Bibliographic data: JP2009535708 (A) — 2009-10-01

**Providing guest users network access based on information read from a mobile telephone or other object**

**Inventor(s):**

**Applicant(s):**

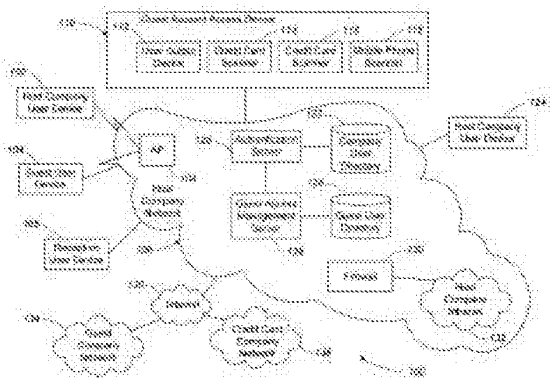
**Classification:** - international: ***G06F1/00; G06F21/20; H04L12/28; H04L12/46; H04L12/56***
- cooperative: **H04L63/0853**; **H04L63/104**; **H04W12/08**; H04W12/04

**Application number:** JP20090507855 20070430

**Priority number (s):** US20060413922 20060428 ; WO2007US10570 20070430

**Also published as:** US2007255837 (A1) US7874006 (B2) US2014304796 (A1) WO2007127485 (A2) WO2007127485 (A3) more

**Abstract not available for JP2009535708 (A)**
**Abstract of corresponding document: US2007255837 (A1)**



Guest user are enabled to access network resources through an enterprise network using a guest user account. A guest user account may be created for a guest for a limited time. Guest account credentials of the guest account may be provided to the guest to use the guest account using any of a variety of techniques described herein, for example, by scanning a guest access card, credit card or mobile telephone of guest user, and providing the guest account credentials to the user based on the information obtained. A guest access management server may be configured to generate and maintain guest accounts, authenticate guest users, and track and log guest activity. A VLAN technology may be used to separate guest traffic from host enterprise traffic on the host enterprise network. After a guest

user is authenticated, communications to and from the guest user may be routed to a guest VLAN.

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審査請求 未請求　予備審査請求 未請求　（全 24 頁）

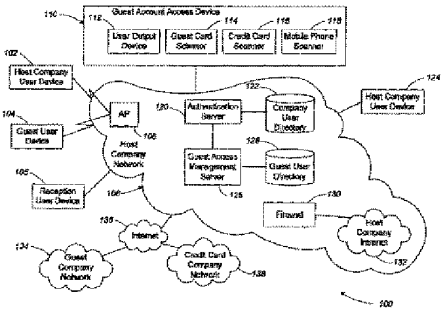
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最終頁に続く

(54)【発明の名称】企業ネットワークを介したネットワーク資源へのゲスト・ユーザ・アクセスの提供

(57)【要約】
ゲスト・ユーザは、ゲスト・ユーザ・アカウントを使用して、企業ネットワークを介してネットワーク資源にアクセスすることが可能になる。ゲスト・ユーザ・アカウントは、限られた時間にゲストに対して作成されてもよい。ゲスト・ユーザのゲスト・アクセス・カード、クレジットカード又は携帯電話をスキャンし、得られた情報に基づいてユーザに対してゲスト・アカウント証明書を提供するなど、本明細書に記載の様々な技術を使用して、ゲスト・アカウントを使用するために、ゲスト・アカウントのゲスト・アカウント証明書をゲストに提供することができる。ゲスト・アクセス管理サーバは、ゲスト・アカウントを生成して維持し、ゲスト・ユーザーを認証し、ゲスト活動を追跡してログするように構成してもよい。ホスト企業ネットワーク上のホスト企業トラフィックからゲストトラフィックを分離するためにＶＬＡＮ技術を使用することができる。ゲスト・ユーザが認証された後、ゲスト・ユーザとの通信はゲストＶＬＡＮに対してルーティングすることができる。



【特許請求の範囲】
【請求項1】
ゲスト・ユーザが企業ネットワークを介してネットワーク資源へアクセスすることを可能にする方法であって、
（ａ）前記ゲスト・ユーザが所有している物から読み取られた情報を受け取るステップと、
（ｂ）前記読み取られた情報に基づいて、前記企業ネットワークを介して前記ネットワーク資源にアクセスするための１つ又は複数のゲスト・アカウント証明書を決定するステップと、
（ｃ）前記ゲスト・ユーザに対して前記１つ又は複数のゲスト・アカウント証明書を示すステップとを含む方法。
【請求項2】
前記物はゲスト・アクセス・カードである請求項１記載の方法。
【請求項3】
前記物はクレジットカードである請求項１記載の方法。
【請求項4】
前記物は携帯電話である請求項１記載の方法。
【請求項5】
（ｄ）前記ゲスト・ユーザのユーザ装置から前記１つ又は複数のゲスト・アカウント証明書を受け取るステップと、
（ｅ）前記１つ又は複数のゲスト・アカウント証明書に基づいて、前記企業ネットワークを介して前記ネットワーク資源へのゲスト・ユーザ・アクセスを提供するステップとをさらに含む請求項１記載の方法。
【請求項6】
前記ゲスト・アカウント証明書に対応するゲスト・アカウントは、制限された時間の期間を有するように構成され、前記方法は、
（ｆ）前記制限された時間の終了後に前記ネットワーク資源へのゲスト・ユーザ・アクセスを拒否するステップをさらに含む請求項５記載の方法。
【請求項7】
前記ゲスト・アカウント証明書に対応するゲスト・アカウントは、１つ又は複数の特定の時間期間中にのみネットワーク資源へのゲスト・ユーザ・アクセスを許可するように構成され、前記方法は、
（ｆ）前記１つ又は複数の特定の時間期間外に前記ネットワーク資源へのゲスト・ユーザ・アクセスを拒否するステップをさらに含む請求項５記載の方法。
【請求項8】
前記企業ネットワークは、ゲスト・ユーザに対する第１の仮想ローカルエリアネットワークを含む複数の仮想ローカルエリアネットワークを定義するように構成され、
前記ステップ（ｅ）が、前記第１の仮想ローカルエリアネットワークの一部として定義されたネットワーク資源のみに対するゲスト・ユーザ・アクセスを提供するステップを含む請求項５記載の方法。
【請求項9】
前記第１の仮想ローカルエリアネットワークがインターネットを含むように定義される請求項８記載の方法。
【請求項10】
前記ステップ（ｂ）は、前記読み取られた情報に基づいてゲスト・アカウント同一性及びパスワードを決定するステップを含み、
前記ステップ（ｃ）は、前記ゲスト・ユーザに対して前記ゲスト・アカウント同一性及びパスワードを示すステップを含む請求項１記載の方法。
【請求項11】

前記ステップ（ａ）は、前記ゲスト・アクセス・カードから読み取られた前記ゲスト・アカウント同一性及びパスワードを受け取るステップを含む請求項１０記載の方法。
【請求項12】
（ｄ）ゲスト・アクセス・カードから情報を読み取るステップをさらに含む請求項１記載の方法。
【請求項13】
前記ステップ（ｃ）は、前記ゲスト・ユーザに対して前記１つ又は複数のゲスト・アカウント証明書を表示するステップを含む請求項１記載の方法。
【請求項14】
ゲスト・ユーザが企業ネットワークを介してネットワーク資源へアクセスすることを可能にするためのシステムであって、
前記ゲスト・ユーザが所有している物から読み取られる情報に基づいて、前記企業ネットワークを介して前記ネットワーク資源にアクセスするための１つ又は複数のゲスト・アカウント証明書を決定し、前記１つ又は複数のゲスト・アカウント証明書を前記ゲスト・ユーザに対して示すことを開始する、ゲスト・アクセス管理サーバを含むシステム。
【請求項15】
前記物は、ゲスト・アクセス・カード、クレジットカード、又は携帯電話のうちの１つである請求項１４記載のシステム。
【請求項16】
前記物から前記情報を受け取るゲスト・アクセス・アカウント装置をさらに含む請求項１４記載のシステム。
【請求項17】
前記ゲスト・ユーザに対して１つ又は複数のゲスト・アカウント証明書を示すためのユーザ出力装置をさらに含む請求項１６記載のシステム。
【請求項18】
前記ゲスト・アクセス管理サーバは、前記ゲスト・ユーザのユーザ装置から１つ又は複数のゲスト・アカウント証明書を受け取り、前記１つ又は複数のゲスト・アカウント証明書に基づいて、前記企業ネットワークを介した前記ネットワーク資源へのゲスト・ユーザ・アクセスのためにアクセスを認証するように動作する請求項１４記載のシステム。
【請求項19】
コンピュータ可読媒体と、
前記コンピュータ可読媒体上に格納され、コンピュータによって実行されることの結果として、ゲスト・ユーザが企業ネットワークを介してネットワーク資源へアクセスすることを可能にする方法を実行するように前記コンピュータを制御する命令を定義するコンピュータ可読信号とを含むコンピュータ・プログラム製品であって、前記方法は、
（ａ）前記ゲスト・ユーザのゲスト・アクセス・カードから読み取られた情報を受け取るステップと、
（ｂ）前記読み取られた情報に基づいて、前記企業ネットワークを介して前記ネットワーク資源にアクセスするための１つ又は複数のゲスト・アカウント証明書を決定するステップと、
（ｃ）前記ゲスト・ユーザに対して前記１つ又は複数のゲスト・アカウント証明書を示すステップとを含む、コンピュータ・プログラム製品。
【請求項20】
前記方法は、
（ｄ）前記ゲスト・ユーザのユーザ装置から前記１つ又は複数のゲスト・アカウント証明書を受け取るステップと、
（ｅ）前記１つ又は複数のゲスト・アカウント証明書に基づいて、前記企業ネットワークを介した前記ネットワーク資源へのゲスト・ユーザ・アクセスを提供するステップとをさらに含む請求項１９記載のコンピュータ可読媒体。

【発明の詳細な説明】
【技術分野】

【0001】
本発明は、企業ネットワークを介したネットワーク資源へのゲスト・ユーザ・アクセスの提供に関する。
【背景技術】
【0002】
今日の世界において、企業は、しばしば様々な目的のうちのいずれかのために、ビジター、例えばベンダー、パートナー、クライアント、構成員、同僚、学生などにとってホストとして機能する。これらのゲストは、例えばラップトップ・コンピュータ、ノート型コンピュータ、電話、ブラックベリー（商標）ブランドの装置、ＰＣＳ装置、携帯情報端末（ＰＤＡ）等、自身のモバイルのユーザ装置を使用してインターネットあるいは別のネットワーク（例えば自分の企業のネットワーク）にアクセスすることをしばしば望む。したがって、ホスト企業は、しばしばホスト企業のネットワークを介してネットワーク資源へのゲスト・アクセスを提供する。本明細書において使用される場合、企業とは、会社、法人、組合、個人事業体、他の種類の企業体、組織、非営利組織、行政体及び／又は行政機関、教育機関、他の種類の企業、またこれらの任意の適切な組合せを含むが、これらに限定されるものではない。
【発明の開示】
【発明が解決しようとする課題】
【0003】
ネットワーク資源（例えばホスト・ネットワークの一部、インターネット、ゲスト用の企業ネットワークなど）に対するゲスト・アクセスを提供することは、しばしば専用ハードウェア及び／又はソフトウェアの使用並びにそのインストールやメンテナンスを要求する。これらの専用のソリューションは単純ではない。大部分は、１人又はより多くの管理者あるいは受付係の情報技術（ＩＴ）サポート及び／又は支援を要求する。したがって、ゲストにネットワーク資源へのアクセスを提供するために、ホスト企業は、通常、専用ハードウェア及び／又はソフトウェア、ＩＴサポート及び／又は管理上の支援のコストを招く。
【課題を解決するための手段】
【0004】
本発明の概要は、本発明の態様の説明のためのコンテキストを簡略化した形式で提供する。この概要は、特許請求の範囲を決定するのに使用されるようには意図されていない。本発明の態様は以下の詳細な説明でより十分に説明される。
【0005】
本明細書においては、ゲストが、ゲスト・ユーザ・アカウントを使用して企業ネットワークを介してネットワーク資源へアクセスするのを可能にするシステム及び方法を記載している。ゲスト・ユーザ・アカウントは、限られた時間（１日、２～３日、ある日のうち一定時間（例えば午前９時～午後５時）、１週間、あるいはさらに長い期間）にわたってゲストのために作成されてもよい。ゲスト・アカウントのゲスト・アカウント証明書（例えばゲスト・アカウントＩＤ及びパスワード）がゲストに提供されてもよく、それはゲストがゲスト・アカウントを使用することを可能にする。本明細書に記載されたものを含む様々な技術のうちのいずれも、ユーザにゲスト・アカウント証明書を提供するために使用できる。証明書の提供は、ゲスト・ユーザから情報を得て、当該情報の取得に応じてゲスト・アクセス証明書を提供することを含んでもよい。ゲスト・ユーザに関する情報を得ることは、ゲスト・ユーザのゲスト・アクセス・カード、クレジットカードもしくは携帯電話をスキャンすること、電子メール又は手紙を受け取ること、又は対面で口頭によりもしくは電話により取得することを含んでもよい。ゲスト・アクセス管理サーバは、ゲスト・アカウントを生成して維持し、ゲスト・ユーザを認証し、ゲストの行動を追跡してログするように構成されてもよい。
【0006】
いくつかの実施例では、仮想ＬＡＮ（つまりＶＬＡＮ）技術を使用して、ホスト企業ネ

ットワーク上のホスト企業トラフィックからゲスト・トラフィックを分けてもよい。ＶＬＡＮ技術の使用によって、ホスト企業の既存のネットワークインフラは、インフラを修正せざるを得ない状態に対立するものとして使用することができる。ゲスト・ユーザが認証された後、ゲスト・ユーザへの通信又はゲスト・ユーザからの通信は、ゲストＶＬＡＮへルーティングされてもよい。ゲストＶＬＡＮ内では、ユーザは、インターネットあるいはゲスト企業のネットワークのようなネットワーク資源にアクセスすることを許可されてもよい。

【0007】

本発明の実施例において、ゲスト・ユーザは、企業ネットワークを介してネットワーク資源にアクセスすることが可能になる。ゲスト・ユーザが所有している物（オブジェクト）（例えばクレジットカード、ゲスト・アクセス・カード、携帯電話など）から読み取られる情報が受け取られる。企業ネットワークを介してネットワーク資源にアクセスするための１つ以上のゲスト・アカウント証明書が、読み取られた情報に基づいて決定され、当該１つ以上のゲスト・アカウント証明書がゲスト・ユーザに示される。

【0008】

別の実施例では、企業ネットワークを介してネットワーク資源へゲスト・ユーザがアクセスすることを可能にするためのシステムが提供される。システムは、ゲスト・ユーザが所有している物（例えばクレジットカード、ゲスト・アクセス・カード、携帯電話など）から読み取られる情報に基づいて、企業ネットワークを介してネットワーク資源にアクセスするための１つ以上のゲスト・アカウント証明書を決定し、そして当該１つ以上のゲスト・アカウント証明書をゲスト・ユーザに対して示すことを開始するためのゲスト・アクセス管理サーバを含んでいる。

【0009】

さらに別の実施例では、コンピュータ可読媒体及び当該コンピュータ可読媒体上に格納されたコンピュータ可読信号を含むコンピュータ・プログラム製品が提供される。当該信号は、コンピュータによって実行される結果として、企業ネットワークを介してゲスト・ユーザがネットワーク資源へアクセスするのを可能にする方法を実行するようにコンピュータを制御する命令を定義する。当該方法は、（ａ）ゲスト・ユーザのゲスト・アクセス・カードから読み取られた情報を受け取るステップ、（ｂ）読み取られた情報に基づいて、企業ネットワークを介してネットワーク資源にアクセスするための１つ以上のゲスト・アカウント証明書を決定するステップ、及び（ｃ）ゲスト・ユーザに対して当該１つ以上のゲスト・アカウント証明書を示すステップを含む。

【0010】

別の実施例では、ゲスト・ユーザは企業ネットワークを介してネットワーク資源にアクセスすることが可能になる。ゲスト・ユーザの同一性を確認するクレジットカード・ベンダーからの情報が受け取られる。企業ネットワークを介してネットワーク資源にアクセスするための１つ以上のゲスト・アカウント証明書が、当該受け取られた情報に基づいて決定され、当該１つ以上のゲスト・アカウント証明書がゲスト・ユーザに示される。

【0011】

別の実施例では、企業ネットワークを介したネットワーク資源へのゲスト・ユーザのアクセスを可能にするためのシステムが提供される。システムは、ゲスト・ユーザの同一性を確認するクレジットカード・ベンダーからの情報を受け取り、企業ネットワークを介してネットワーク資源にアクセスするための１つ以上のゲスト・アカウント証明書を当該受け取った情報に基づいて決定し、当該１つ以上のゲスト・アカウント証明書をゲスト・ユーザに示すことを開始するための、ゲスト・アクセス管理サーバを含んでいる。

【0012】

さらに別の実施例では、ユーザは、企業ネットワークを介してネットワーク資源にアクセスすることが可能になる。クレジットカード・ベンダーのサーバにおいて、企業の敷地内のクレジットカード・スキャナによるユーザのクレジットカードから読み取られた情報が受け取られる。ユーザの同一性が受け取られた情報に基づいて確認され、ユーザに関す

る確認情報は企業のゲスト・アクセス・サーバへ送られ、ゲスト・アクセス・サーバは、ゲスト・ユーザが当該エンティティのネットワークを介してネットワーク資源へアクセスすることにつき責任をもつ。

【0013】

別の実施例では、企業ネットワークを介してネットワーク資源へゲスト・ユーザがアクセスすることを可能にするためのシステムが提供される。システムは、企業の敷地内のクレジットカード・スキャナによってユーザのクレジットカードから読み取られた情報を受け取り、受け取った情報に基づいてユーザの同一性を確認し、当該企業のネットワークを介してネットワーク資源へゲスト・ユーザがアクセスすることにつき責任をもつ、当該企業のゲスト・アクセス・サーバに対して、ユーザに関する確認情報を送るように動作する、クレジットカード・ベンダーのサーバを含んでいる。

【0014】

本発明の他の利点、新規な特徴、目的、態様及び実施例は、本発明の態様及び実施例を含む以下の発明の詳細な説明を添付の図面と共に考慮した場合に明白となる。添付の図面は概略的なものであって、一律の縮尺で描かれるように意図されていない。図面において、さまざまな図に示されている同一又はほぼ同一の各構成要素は、単一の参照符号によって表される。明瞭にするために、全ての構成要素が全ての図面においてラベル付けされているとは限らず、当業者に本発明を理解させるのに図解が必要ない場合は本発明の各実施例及び態様の全ての構成要素が示されてはいない。

【発明を実施するための最良の形態】

【0015】

本発明の実施例は、ホスト企業ネットワークを介してネットワーク資源に対するゲスト・ユーザー・ワイヤレス・アクセスを提供することに関して以下に述べられるが、本発明はそのように制限されるものではなく、非ワイヤレス（例えば有線）アクセスについて実施されてもよい。

【0016】

上記の実施例及び本発明の他の実施例の機能及び利点は、以下に述べられた例からより完全に理解される。以下の例は、よりよい理解を容易にし、かつ本発明の利点を説明するように意図されるが、発明の完全な範囲を例証するものではない。

【0017】

明細書又は特許請求の範囲において使用されるように、「備える」、「含む」、「持っている」、「有する」、「包含する」、「含んでいる」という語及び同様の語は、制約されていないこと、つまり、含んでいるが限定されていないということであると理解されるべきである。「からなる」、「本質的に・・・からなる」という移行句はそれぞれ、特許審査手続についての米国特許庁マニュアル（第８版、改定２、２００４年５月）の２１１１．０３項において特許請求の範囲に関して述べられているように、限定されていること又はほぼ限定されていることである。

実施例

いくつかの実施例では、ゲスト・ユーザは、ホスト企業によって発行されたゲスト・アクセス・カードを使用して、ホスト企業を介してゲスト・アクセスを与えられる。ゲストのホスト企業への到着に先立って、あるいはその時に、ゲストはゲスト・アクセス・カードを提供されてもよい。ゲスト・アクセス・カードは、例えばゲスト・アクセスＩＤ及びパスワード等、ゲスト・アカウントのためのゲスト・アカウント証明書を（平文あるいは暗号化された形式で）エンコードしてもよいし、あるいは、ゲスト・アカウント及び／又はゲスト・アカウント証明書に関連付けられる値をエンコードしてもよい。ゲスト・アカウント証明書及び／又は他の情報は、ゲスト・アクセス・カード上の磁気ストライプあるいは半導体メモリに格納されてもよい。

【0018】

ホスト企業（例えばロビー又は受付エリア）への到着に際して、ゲスト・ユーザは、ユーザ装置（例えばラップトップ又はＰＤＡ）を使用して、ネットワーク資源（例えばイン

ターネット及び／又はゲストの企業ネットワーク）にアクセスすることを試みてもよいし、ゲスト・アカウント証明書（例えばゲスト・アカウントＩＤ及びパスワード）を促されてもよい。ネットワーク資源にアクセスすることを試みる前や、その間やその後に、ゲスト・ユーザは、ホスト企業の敷地（例えば受付エリアかロビー）内でスキャナを使用して、ゲスト・アクセス・カード（例えば、磁気的、光学的又はＲＦ技術を使用したもの）をスキャンしてもよく、当該スキャナはこの目的のために特に設計されてもよい。ホスト・ネットワーク上のゲスト・アクセス管理サーバは、スキャンされた情報を受け取り、ゲスト・アカウント証明書を決定してもよい。この決定は、単に、ゲスト・アクセス・カードにより提供されるゲスト・アカウント証明書を読み取ったり、カード上の暗号化されたアカウント情報を解読したり、あるいはカードによって提供される情報をゲスト・アカウントＩＤ及びパスワードにマッピングすることにより行うことができる。ゲスト・アカウント証明書は、それをゲスト・ユーザに、例えば、ゲスト・ユーザ及び／又はスキャナの近くの装置に示すことができる装置へ送られてもよい。そのような装置は、ディスプレイ装置（例えばモニタ）、プリンタ、バッジ及び／又はＩＤカードを生成する装置、スピーカ、電話、別の種類の装置、あるいはこれらの任意の適切な組合せのいずれかであるか、又はこれらをふくんでもよい。

【0019】

その後、ゲスト・ユーザは、ユーザ装置（例えばラップトップやＰＤＡ）を使用し、ゲスト証明書を使用して、ホスト企業ネットワークにログインすることができる。ホスト企業ネットワークは、ゲスト・ユーザのアクセスを、例えばインターネット及び／又はゲスト用の企業ネットワークに、限定するように構成されてもよい。例えば、ホスト企業ネットワークは、ゲスト・ユーザのゲスト・アクセス・アカウントに基づいてゲストのアクセスを制限するために仮想ローカルエリアネットワーク（ＶＬＡＮ）技術を使用してもよい。その後、ホスト企業ネットワークは、ゲストのネットワーク活動を監視し、必要な場合、例えばインターネットのような特定のネットワーク資源へのアクセスについてゲスト・ユーザに請求をする。

【0020】

さらに、ゲスト・アカウントは、例えば一定の（例えば、所定の）時間、日、週、月あるいはその組合せのような制限された期間をもつように構成されてもよい。ゲスト・アカウントは、例えば、３日間の期間にわたって午前９時から午後５時までの制限された期間内の特定の時間にのみ使用するために構成されてもよい。

【0021】

本発明のいくつかの実施例において、ホスト企業よって発行されたゲスト・アクセス・カードを使用するのではなく、ゲスト・ユーザは、ネットワーク資源にホスト企業のネットワークを介してアクセスするために、例えばビザ、マスターカード、アメリカンエクスプレス、ディスカヴァーなどのようなクレジットカード・ベンダーによって発行されたクレジットカードを使用してもよい。ラップトップあるいは他のユーザ装置を使用してネットワーク資源にアクセスすることを試みる前に、又はその間に、又はその後に、ゲスト・ユーザは、ホスト企業の敷地内でスキャナを使用してクレジットカードをスキャンしてもよい。スキャンから生じる情報は、クレジットカード会社のネットワークへ送られ、当該会社はゲスト・ユーザの同一性を確認することができる。その後、クレジットカード会社は、ホスト企業ネットワークへ、例えばホスト企業ネットワーク上のゲスト・アクセス管理サーバへ、ゲスト・ユーザに関する確認情報を送ってもよい。当該確認情報の受信に応じて、ゲスト・アクセス管理サーバは、ゲスト・アカウント及びゲスト・アカウント証明書を生成し、当該証明書を（例えば上述のようにして）ゲスト・ユーザに対して示す（例えば表示する）装置へ、当該証明書を送ってもよい。その後、ゲスト・ユーザは、ホスト企業ネットワークにログインするために証明書を使用することができる。例えば、上述のように、ゲストのネットワーク資源へのアクセスは制限されてもよいし、ゲストの活動はモニタされ料金請求されてもよい。さらに、ゲスト・アカウントを使用したアクセスの期間及び特定の時間は制限されてもよい。

【0022】
いくつかの実施例中で、ゲスト・アクセス・カードか既存のクレジットカードを使用するのではなく、ゲスト・ユーザは、ネットワーク資源にホスト企業のネットワークを介してアクセスするために携帯電話を使用してもよい。ホスト企業の敷地で提供される携帯電話スキャナを使用して、ゲスト・ユーザは、ゲストの携帯電話、例えば、携帯電話の加入者識別モジュール（ＳＩＭ）カード上に格納された情報をスキャンしてもよい。この情報はゲスト・アクセス管理サーバへ送られ、当該サーバは、スキャンされた情報の受信に応じて、ゲスト・アカウント及びゲスト・アカウント証明書を生成してもよい。例えば、上述のように、ゲスト・アカウント証明書は、装置へ送られ、ユーザに示されてもよい（例えば、表示されてもよい）。その後、ラップトップあるいは他のユーザ装置を使用して、ゲスト・ユーザは、ゲスト証明書の入力によりホスト企業ネットワークを介してネットワーク資源にアクセスすることができる。上述と同様に、ゲスト・ユーザーのアクセスは特定のネットワーク資源に制限されてもよいし、特定の期間及び当該期間内の特定の時間に制限されてもよいし、ゲスト・ユーザの活動はモニタされ、必要に応じて料金請求されてもよい。
【0023】
いくつかの実施例では、ゲスト・ユーザは、ホスト企業への到着前にゲスト・アカウント証明書を提供されてもよく、あるいは、ゲスト企業において受付係又は別の管理者がゲストの到着の際にゲスト・ユーザにゲスト・アカウント証明書を提供してもよい。そのような実施例では、ゲスト・ユーザは、単に、ゲスト・カード、クレジットカード、携帯電話あるいは他のアイテムを最初にスキャンする必要なしに、ゲスト・アカウント証明書を使用して、ネットワークにログインすることができる。
【0024】
図１は、本発明のいくつかの実施例による、ホスト企業ネットワークを介してネットワーク資源へゲスト・ユーザがアクセスすることを可能にするシステム１００の例を説明するブロック図である。システム１００は、ホスト企業ネットワークを介してネットワーク資源へゲスト・ユーザがアクセスすることを可能にするためのシステムの実例となる実施例に過ぎず、本発明の範囲を制限するようには意図されない。そのようなシステムに対する様々な実施、例えばシステム１００の変更のいずれもが可能であり、本発明の範囲内にあるように意図される。
【0025】
システム１００は、１つ以上のホスト企業ユーザ装置（例えば１０２及び１２４）、１つ以上のゲスト・ユーザ装置（例えば１０４）、１つ以上の受信ユーザ装置（例えば１０５）、１つ以上のゲスト・アカウント・アクセス装置（例えば１１０）、ホスト企業ネットワーク１０６、インターネット１３６、１つ以上のゲスト企業ネットワーク（例えば１３４）、１つ以上のクレジットカード会社ネットワーク（例えば１３８）、及びこれらの任意の適切な組合せのうちいずれを含んでもよい。
【0026】
本明細書において使用される場合、「ネットワーク」は、伝送媒体の１つ以上のセグメントによって相互接続された２つ以上の構成要素のグループであって、当該伝送媒体を介して通信が構成要素間で交換され得るものである。各セグメントは、１つ以上の電気的もしくは光学的なワイヤ、金属及び／又は光ファイバで作られたケーブル、空気（例えば、搬送波を介した無線伝送を使用して）又はこれら伝送媒体の任意の組合せを含む複数の種類の伝送媒体のいずれかであってもよい。本明細書にて使用される場合、「複数」は２以上を意味する。ネットワークが単一配線、バス、ワイヤレス接続あるいは他の種類のセグメントで接続されている２つのコンポーネントと同じくらい単純であり得ることが認識されるべきである。さらに、ネットワークが本願の図面中で図中の素子に接続されるように図示される場合、接続している素子がそれ自身ネットワークの一部と考えられることは認識されるべきである。
【0027】

本明細書において使用される場合、「ネットワーク装置」は、ワークステーション、パーソナルコンピュータ、端末、ラップトップ・コンピュータ、終端局、ユーザ装置、サーバ、ゲートウエイ、レジスタ、スイッチ、ルーター、ハブ、ブリッジ、ディレクトリ、送信機、受信機、トランシーバー、無線アクセスポイント（ＡＰ）、リピーター及びその任意の組合せを含み、これらに限定されない、ネットワーク上で通信するように動作する装置である。本明細書において使用される場合、「ユーザ装置」は、ユーザがそれに対して通信を送信／受信でき、通信ネットワーク上での通信にとって終点として機能し得るネットワーク装置である。ユーザ装置は、ワークステーション、パーソナルコンピュータ（例えばＰＣ）、ラップトップ・コンピュータ、ノート型コンピュータ、電話（例えば地上通信線又はモバイル）、ページャ、ブラックベリー（商標）ブランドの装置、ＰＣＳ装置、携帯情報端末（ＰＤＡ）、スマートフォン、双方向無線機（例えば「ウォーキートーキー」）、他の種類のユーザ装置及びこれらの任意の適切な組合せを含むがこれらに限定されない。

【0028】

ネットワーク（例えばネットワーク１０６、１３２、１３４、１３６及び１３８のうちのいずれか）は、ローカルエリアネットワーク（ＬＡＮ）、メトロポリタン・エリア・ネットワーク（ＭＡＮ）、広域ネットワーク（ＷＡＮ）、ワイヤレス・ネットワーク、陸上移動通信網（ＰＬＭＮ）、グローバル移動体通信システム（ＧＳＭ）ネットワーク、汎用パケット無線システム（ＧＰＲＳ）ネットワーク、ユニバーサル・モバイル・テレコミュニケーション・システム（ＵＭＴＳ）ネットワーク、符号分割多重アクセス方式（ＣＤＭＡ）ネットワーク、光学ネットワーク、データ網、企業規模ネットワーク、無線パーソナル・エリア・ネットワーク（ＰＡＮ）、ホームネットワーク、電気通信ネットワーク、公衆交換電話網（ＰＳＴＮ）、広帯域ネットワーク、別の種類のネットワークあるいはこれらの任意の適切な組合せを含むがこれらに限定されない、様々な種類のネットワークのうちの何かであってもよいしこれを含んでもよい。

【0029】

ホスト企業ネットワーク１０６は、上述の種類のうちのいずれかの１つ以上のネットワーク装置を含んでいてもよく、１つ以上の無線アクセスポイント（ＡＰ）（例えば１０８）、１つ以上の認証サーバ（例えば１２０）、１つ以上の企業ユーザディレクトリ（例えば１２２）、１つ以上のゲスト・アクセス管理サーバ（例えば１２６）、１つ以上のゲスト・ユーザディレクトリ（例えば１２８）、１つ以上のファイアウォール（例えば１３０）、ホスト企業イントラネット（１３２）、他のネットワーク装置あるいはこれらの任意の適切な組合せのうちいずれを含んでもよい。

【0030】

例えばルーター、スイッチ及び／又はその組合せ（図示せず）のようなホスト企業ネットワーク１０６の１つ以上のコンポーネントが、１つ以上のＶＬＡＮを定義するように構成されてもよい。これらのＶＬＡＮ（つまりゲストＶＬＡＮ）の１つ以上は、１つ以上のゲスト・アクセス・アカウント及び１つ以上のネットワーク資源を含むように定義されてもよい。ゲストＶＬＡＮ内に含まれた１つ以上のネットワーク資源は、インターネット、ゲスト企業ネットワーク及びおそらくはホスト・ネットワーク１０６上に存在する１つ以上のネットワーク資源を含んでもよく、その結果、ゲスト・ユーザはこれらの資源のみへのアクセスに制限されている。他の１つ以上のＶＬＡＮがホスト企業ユーザー（例えば従業員と役員）に関連付けられ得る。これらのホスト企業ＶＬＡＮはゲストＶＬＡＮよりホスト企業ネットワーク１０６上のより多くの資源を含むように定義され、それにより、当該企業ネットワーク上の資源へのアクセスを与えられなくてもよいゲスト・ユーザーに比べて、企業ネットワーク上のより多くの資源に対するアクセスを企業ユーザーに提供する。例えば、ホスト企業ＶＬＡＮはホスト企業イントラネット１３２を含むように構成されてもよい。

【0031】

ＡＰ１０８は、ホスト企業ユーザ装置（例えば１０２と１２４）及びゲスト・ユーザ装

置（例えば１０４）を含むユーザ装置のために、ホスト企業ネットワーク１０６に対するワイヤレス・アクセスを提供するように構成されてもよい。ＡＰ１０８は、ユーザ装置から受け取られたユーザ証明書を認証サーバ１２０に渡すように構成されてもよい。認証サーバ１２０は、例えば企業ユーザーディレクトリー１２２へアクセスすることより、当該ユーザ証明書がホスト企業ユーザを識別するかどうか判断するように構成されてもよい。ユーザ証明書がユーザをホスト企業の許可されたユーザとして識別する場合、ユーザが属する１つ以上のＶＬＡＮにより、ユーザは、ホスト企業ネットワーク１０６の資源へのアクセスが与えられる。

【0032】

ユーザ装置によって提供されるユーザ証明書がホスト企業ユーザのものではないと認証サーバ１２０が決定すると、認証サーバ１２０は、ゲスト・アクセス管理サーバ１２６へ当該ユーザ証明書を渡してもよい。あるいは、サーバ１２６は、認証サーバ１２０を最初に通過することなく、ＡＰ１０８から証明書を受け取ってもよい。サーバ１２６は、例えばゲスト・ユーザーディレクトリー１２８へアクセスすることにより、ユーザ証明書がゲスト・ユーザを識別するかどうか判断してもよい。ユーザ証明書がユーザをゲスト・ユーザとして識別する場合、ゲスト・ユーザは、ゲストＶＬＡＮのメンバーがアクセスを許可されるネットワーク資源のみへのアクセスを提供されてもよい。

【0033】

本発明のいくつかの実施例では、ユーザ装置（例えば１０２、１０４あるいは１２４のうちのいずれか）は、例えば当該ユーザ装置の近くにあるＡＰとの通信を確立することにより、ユーザ装置の近くの任意のネットワークを発見するように構成されてもよい。例えば、ユーザ装置は、例えばユーザ装置がブートされるとき（つまり、電源が入れられたとき）にオペレーティング・システムが立ち上げられるのに応じて近傍にあるネットワークを発見するように構成されたオペレーティング・システム（例えば、後に記載するマイクロソフト・コーポレーションから市販されているオペレーティング・システムの１つ）を含んでもよい。ユーザ装置がホスト企業ユーザ装置（例えば１０２）である場合、ユーザ装置は、ユーザ装置とＡＰの間で交換された以前の通信に基づいて、ホスト企業ネットワーク１０６で情報を交換することを許可されてもよい。例えば、ホスト企業ユーザ装置のオペレーティング・システムは、接続を確立するために、以前にユーザ装置とＡＰの間で交換されたユーザ証明書を自動的に提供してもよい。

【0034】

ＡＰ及び／又はゲスト・ユーザ装置は、ゲスト・ユーザ装置が以前に認証されていない場合にそのことを認識するように構成されてもよい。そのような場合、ゲスト・ユーザ装置のオペレーティング・システムは、ゲスト・アカウント証明書（つまりゲスト・アカウントＩＤ及びパスワード）をユーザに促すように構成されてもよい。ゲスト・ユーザ装置は、単に、有効なゲスト・ユーザ証明書の提供によりホスト企業ネットワークへのアクセスを許可されてもよい。

【0035】

本発明のいくつかの実施例では、ゲスト・ユーザ装置のユーザは、ホスト企業の敷地へ到着する前に（例えば電子メール、紙メール、電話などによって）、又は当該敷地への到着の際に受付係あるいは他の管理者によって、ゲスト・アカウント証明書を提供されてもよい。例えば、到着に際して、受付係あるいは他の管理者は、ゲスト・アカウント証明書を得るため、ゲスト・アクセス管理サーバ１０６と連絡をとるために受信ユーザ装置１０５を使用してもよい。

【0036】

大量のゲスト・ユーザーがホスト企業を訪れる場合、企業の敷地への到着に先立ってゲスト・アカウント証明書を得ることが望ましいかもしれない。そのような状況では、ホスト企業のＩＴスタッフ又は管理者は、ホスト企業を訪れるすべてのゲストについて情報をインポートするために、ゲスト・アクセス管理サーバ１２６を使用することができる。そのような情報は、名前、職名、ゲスト・アクセスが必要になる時間の長さ等を含んでもよ

い。ゲスト・アクセス管理サーバ１２６は、個々の将来のゲストに対して異なるゲスト・アカウント証明書を提供してもよい。ホスト企業の敷地への到着に際して、各ゲスト・ユーザは、以前に提供されたゲスト・アカウント証明書を使用して、ＡＰ１０８あるいは別のアクセス・ポイントを介してホスト企業ネットワーク１０６にログオンすることができる。その後、ゲスト・アクセス管理サーバ１２６は、例えば当該ユーザ証明書をゲスト・ユーザーディレクトリー１２８に格納されたユーザ証明書と比較することにより、ゲスト・ユーザーの各々を認証してもよい。

【0037】

発明のいくつかの実施例では、例えばデバイス１１０等のゲスト・アカウント・アクセス・デバイスの使用を通じて、ホスト企業の敷地に到着した後、ゲスト・ユーザーはゲスト・ユーザ証明書を得る。デバイス１１０は、ユーザ出力装置１１２、ゲスト・カード・スキャナ１１４、クレジットカード・スキャナ１１６、携帯電話スキャナ１１８、他のコンポーネント、及びこれらの任意の適切な組合せのいずれを含んでもよい。ユーザ出力装置１１２、ゲスト・カード・スキャナ１１４、クレジットカード・スキャナ１１６及び携帯電話スキャナ１１８の１つ以上が、別個のゲスト・アカウント・アクセス装置上に存在してもよく、これらのコンポーネントの１つ以上が単一のコンポーネントとして統合されてもよいことが理解されるべきである。

【0038】

ユーザ出力装置１１２は、例えばモニタ、プリンタあるいはバッジ生成装置等のユーザに対して情報を表示するのに適した、又は、例えばスピーカや電話等の他の方法で（例えば音声を介して）ユーザに対して情報を示すのに適した任意の種類の出力装置の１つ以上を含んでもよい。ユーザ出力装置１１２は、ゲスト・アカウント・アクセス装置１１０の一部であることに制限されず、装置１１２と別個の異なるものでもよいことが理解されるべきである。

【0039】

ゲスト・カード・スキャナ１１４は、ゲスト・ユーザによって提供されるゲスト・カードをスキャンするように構成されてもよい。ゲスト・カードは、ゲスト・アカウント証明書を有していてもよいし、あるいは、例えば平文又は暗号化されたフォーマットでその上にエンコードされたアカウントへの値マッピングを有していてもよい。ゲスト・アクセス・カードは、磁気ストリップ、半導体メモリあるいは他の形式の媒体上に情報を格納してもよい。さらに、ゲスト・アクセス・カードは、送信機あるいは信号及び／又は情報を送信／受信するための他の手段を含んでもよい。ゲスト・アクセス・カード・スキャナ１１４は、磁気的に保存した情報を読むための１つ以上のコンポーネント（例えばヘッド）、及び／又はゲスト・カードから送信された情報を受信するための受信機又はトランシーバーで構成されてもよい。さらに、スキャナ１１４は、例えばホスト企業ネットワーク１０６の１つ以上のセグメントにわたって、ゲスト・アクセス管理サーバ１２６へ、ゲスト・アクセス・カードからスキャンされた情報を送るように構成されてもよい。

【0040】

クレジットカード・スキャナ１１６は、クレジットカードをスキャンし、かつ適切なクレジットカード会社ネットワーク（例えば１３８）に当該スキャンされた情報を送信するための１つ以上のコンポーネント（例えばヘッド）、及び／又はクレジットカード会社ネットワーク１３８に対して当該情報を送信するように構成されたホスト企業ネットワーク１０６のコンポーネント（例えばゲスト・アクセス管理サーバ１２６）で構成されてもよい。

【0041】

本発明のいくつかの実施例では、ホスト企業は、１社以上のクレジットカード会社と提携している。ホスト企業は、各会社の確認サービスにある額のお金を払ってもよい。ホスト企業がゲスト・アクセスを課す必要がある場合、クレジットカード会社はクレジットカード上のアクセスのために料金請求することができる。

【0042】

いくつかの実施例では、スキャナ１１４及び１１６が同じ装置の一部として統合されてもよいし、これらコンポーネントがゲスト・アクセス・カード及びクレジットカードから情報を読み出すのに使用されてもよいことが認識されるべきである。 そのような実施例では、スキャニング装置は、スキャンされたカードがクレジットカードであるかそれともゲスト・アクセス・カードであるかを、スキャンされた情報（例えば、それはフォーマット及び／又は内容である）から決定し、従って続行するように構成されてもよい。例えば、スキャンされたカードがゲスト・アクセス・カードであると決定した場合、スキャニング装置はゲスト・アクセス管理サーバ１２６へスキャンされた情報を送ってもよいし、そうでなければ、適切なクレジットカード・ベンダーのもとへスキャンされた情報を送ってもよい。

【0043】

携帯電話スキャナ１１８は、ゲスト・ユーザーの携帯電話から、例えばユーザーの携帯電話のＳＩＭカードから、携帯電話ユーザに関する情報を読み取るように構成されてもよい。携帯電話スキャナ１１８は、携帯電話からこの情報を電磁的に及び／又は光学的に読み取り、ユーザに関する当該情報をゲスト・アクセス管理サーバ１２６へ送るように構成されてもよい。

【0044】

ゲスト・アクセス管理サーバ１２６は、平文あるいは暗号化された形式のゲスト・アカウント証明書（例えばゲスト・アカウントＩＤ及びパスワード）、ゲスト・アカウント証明書に対応する情報、ユーザに対応する情報、他の情報又はこれらの任意の適切な組合せを受け取るように構成されてもよい。そのような情報を受信することに応答して、サーバ１２６は、ゲスト・アカウント証明書を決定し、例えばユーザ出力装置１１２等の１つ以上の他のネットワークコンポーネントにそれを提供してもよい。例えば、ゲスト・アクセス管理サーバ１２６は、クレジット会社ネットワーク１３８からユーザに関する確認情報を受信し、携帯電話スキャナ１１８から携帯電話ユーザに関する情報を受信し、及び／又はゲスト・カード・スキャナ１１４からゲスト・アカウント証明書に対応する情報についてのゲスト・アカウント証明書を受信するように構成されてもよい。

【0045】

サーバ１２６は、自身が（例えばゲスト・カード・スキャナ１１４から）受信する情報に含まれたゲスト・アカウント証明書を決定し、及び／又は、携帯電話スキャナ１１８及びクレジットカード会社ネットワーク１３８からそれぞれ受信したユーザー情報又はユーザ確認情報に応答してゲスト・アカウント証明書を作成するように構成されてもよい。ゲスト・アクセス管理サーバ１２６は、ゲスト・ユーザーディレクトリー１２８にゲスト・アカウント証明書を格納し、ゲスト・ユーザーを認証するためにこれらの証明書を使用してもよい。

【0046】

システム１００及びそのコンポーネントは、ソフトウェア（例えばＣ、Ｃ＃、Ｃ＋＋、Ｊａｖａ（登録商標）あるいはその組合せ）、ハードウェア（例えば１つ以上の特定用途向け集積回路）、ファームウェア（例えば電気的にプログラムされたメモリ）あるいはその任意の組合せを含む様々な技術のうちのいずれを使用して実施されてもよい。システム１００の１つ以上のコンポーネントは、単一装置（例えばコンピュータ）上に存在してもよいし、又は、１つ以上のコンポーネントが別個の個別の装置上に存在してもよい。さらに、各コンポーネントは、複数の装置にわたって分散されてもよいし、デバイスの１つ以上は相互に接続されてもよい。

【0047】

さらに、システム１００の１つ以上のコンポーネントを含んでいる１つ以上の装置の各々において、コンポーネントの各々は、システム上の１つ以上の位置に存在してもよい。例えば、これらのシステムのコンポーネントの異なる部分は、装置上でメモリ（例えばＲＡＭ、ＲＯＭ、ディスクなど）の異なるエリアに存在してもよい。そのような１つ以上の装置の各々は、他のコンポーネントもあるが、１つ以上のプロセッサ、記憶装置、ディス

クストレージシステム、１つ以上のネットワークインターフェース及び１つ以上のバスあるいは様々なコンポーネントを相互に連結させる他の内部通信リンクのような複数の既知のコンポーネントを含んでもよい。システム１００、及びそのコンポーネントは、図６及び７に関して下記に述べられたようなコンピュータシステムを使用して実施されてもよい。

【0048】

図２は、本発明のいくつかの実施例による、ゲスト・ユーザ（例えばゲスト・ユーザ装置１０４のユーザ）が企業ネットワーク（例えばネットワーク１０６）を介してネットワーク資源にアクセスすることを可能にする方法２００の例を説明するフローチャートである。方法２００は、ゲスト・ユーザが企業ネットワークを介してネットワーク資源へアクセスするのを可能にする方法の実例となる実施例に過ぎず、本発明の範囲を制限するようには意図されない。そのような方法の多数の他の実施例、例えば方法２００の変更のいずれも可能であって、本発明の範囲内にあるように意図される。

【0049】

ステップ２０２において、ゲスト・ユーザは、企業の敷地、例えば企業のオフィスの受付エリア又はロビーに到着する。ステップ２０４において、例えば、図３－５に関して以下に述べられるように、ユーザは１つ以上のゲスト・アカウント証明書を得てもよい。上述のように、いくつかの実施例では、ゲスト・ユーザがホスト企業の敷地に到着する前に、ゲスト・アカウント証明書が得られてもよいことが理解されるべきである。

【0050】

ステップ２０６において、ゲスト・ユーザは企業ネットワークに対してゲスト・アカウント証明書を提供してもよい。例えば、ゲスト・ユーザは、プロンプトに応じて、ユーザ装置（例えば装置１０５）を介してゲスト・アカウント証明書を入力してもよい。これらのゲスト・アカウント証明書は、例えばゲスト・アクセス管理サーバ１２６等のネットワークの認証コンポーネントに渡されてもよい。

【0051】

ステップ２０８において、企業ネットワークは、ゲスト・アカウント証明書に基づいて、企業ネットワークを介したネットワーク資源へのゲスト・ユーザのアクセスを提供してもよい。例えば、ゲスト・アカウント証明書はゲスト・アクセス管理サーバ１２６に渡されてもよく、当該サーバは、ゲスト・ユーザーディレクトリー１２８を使用して、証明書を確認してもよい。ゲスト・アカウント証明書が認証されると、ゲストは例えばインターネット１３６、ゲスト企業ネットワーク１３４及びおそらくはホスト企業ネットワーク１０６自体における資源等のネットワーク資源へのアクセスを提供される。これらのネットワーク資源へのアクセスはＶＬＡＮ技術を使用して規制されてもよい。すなわち、インターネット及びゲスト企業ネットワーク、ネットワーク１０６の制限された量の資源及び／又は１つ以上のゲスト・アカウントを含む１つ以上のＶＬＡＮが定義されてもよい。ホスト企業ネットワーク１０６上の１つ以上のコンポーネント（例えばルーター、スイッチあるいはその適切な組合せ）が、ゲスト・ユーザによって提供されるゲスト・アカウントＩＤに基づいて、１つ以上のそのようなＶＬＡＮについて定義されたネットワーク資源へのアクセスを制御するように構成されてもよい。他の技術がゲスト・ユーザ・アクセスを規制するために使用されてもよい。

【0052】

ステップ２１０において、ホスト企業ネットワークは、ゲスト・ユーザの行動、例えば、ゲスト・ユーザがアクセスするネットワーク資源及び／又はゲスト・ユーザが通信を交換するネットワーク資源を監視してもよい。ステップ２１２において、ホスト企業ネットワークは、ある行動、例えばインターネット等の特定のネットワーク資源へのアクセスについてゲスト・ユーザに料金を請求してもよい。

【0053】

ゲスト・ユーザに提供されるゲスト・アカウントは、期間を制限され、この期間中の特定の時間の間にのみ使用するように構成されてもよい。例えば、ユーザアカウントは、３

日の期間中（例えば月曜から水曜）に例えば、午前９時から午後５時の営業時間のみに使用されるように構成されてもよい。従って、ゲスト管理アクセスサーバ及びホスト企業ネットワーク上のトラフィックをルーティングする責任のあるネットワークコンポーネントは、ゲスト・アカウントの期間が終了するときに、及びゲスト・ユーザがゲスト・アクセスのために指定された特定の時間以外にネットワーク資源にアクセスすることを試みたときに、ゲスト・ユーザに対してアクセスを拒むように構成されてもよい。ゲスト・アクセス管理サーバ及びこれらの他のコンポーネントは、ログインする時及び／又はゲスト企業ネットワーク上でパケットを送信する時にゲスト・ユーザによって提供されるゲスト・アカウント証明書に基づいて、そうするように構成されてもよい。ゲスト・ユーザーディレクトリー１２８におけるゲスト・アカウントについてのエントリ（例えば記録）は、ゲスト・アクセス・アカウントのための期間及び／又は特定のアクセス時間を指定する１つ以上の情報要素を含んもよい。

【0054】

方法２００は追加のステップを含んでもよい。さらに、ステップは他の順序で実行されてもよいし、及び／又はステップの１つ以上が少なくとも部分的に順次に又は並列に実行されてもよいので、方法２００の一部として実行されるステップの順序は、図２に例示された順序に限定されない。例えば、ステップ２０４はステップ２０２の前に実行されてもよいし、ステップ２１０及び２１２は、少なくとも部分的に、並列に実行されてもよい。

【0055】

図３は、本発明のいくつかの実施例による、ゲスト・アクセス・カードを使用して企業ネットワークを介してネットワーク資源へゲスト・ユーザがアクセスすることを可能にする方法３００の例を説明するフローチャートである。方法３００は、ゲスト・アクセス・カードを使用して企業ネットワークを介してネットワーク資源へユーザがアクセスするのを可能にする方法の実例となる実施例に過ぎず、本発明の範囲を制限するようには意図されない。そのような方法の他の実施、例えば方法３００の変更、は可能であって、本発明の範囲内にあるように意図される。

【0056】

ステップ３０２において、例えば、ゲスト・カード・スキャナ１１４に関して上述されるように、情報がユーザのゲスト・アクセス・カードから読み取られてもよい。次に、ステップ３０４において、例えば、ゲスト・アクセス管理サーバ１２６に関して上述されるように、１つ以上のゲスト・アカウント証明書がゲスト・アクセス・カードから読み取られた情報に基づいて決定されてもよい。ステップ３０６において、例えば、ユーザ出力装置１１２に関して上述されるように、１つ以上のゲスト・アカウント証明書がゲスト・ユーザに示されてもよい（例えば、表示又は音声として再生されてもよい）。方法３００は追加のステップを含んでもよい。

【0057】

図４は、本発明のいくつかの実施例による、クレジットカードを使用して、企業ネットワークを介してネットワーク資源へユーザがアクセスすることを可能にする方法４００の例を説明するフローチャートである。方法４００は、クレジットカードを使用して企業ネットワークを介してネットワーク資源へユーザがアクセスすることを可能にする方法の実例となる実施例に過ぎず、本発明の範囲を制限するようには意図されない。そのような方法の他の実施、例えば方法４００の変更は可能であり、本発明の範囲内にあるように意図される。

【0058】

ステップ４０２において、例えば、クレジットカード・スキャナ１１６に関して上述されるように、情報がゲスト・ユーザのクレジットカードから読み取られてもよい。ステップ４０４において、クレジットカードから読み取られた情報は、クレジットカード・ベンダー、例えば上述のようなクレジットカード会社ネットワーク１３８へ送られてもよく、クレジットカード会社は、ステップ４０６においてゲスト・ユーザの同一性を確認してもよい。ステップ４０８において、クレジットカード・ベンダーは、上述のように、企業ネ

ットワーク、例えばゲスト・アクセス管理サーバ１２６へ、ゲスト・ユーザに関する確認情報を送ってもよい。ステップ４１０において、１つ以上のゲスト・アカウント証明書が、例えばゲスト・アクセス管理サーバ１２６に関して上述されるように、確認情報に基づいて作成されてもよい。方法４００は追加のステップを含んでもよい。

【0059】

図５は、本発明のいくつかの実施例による、携帯電話を使用して企業ネットワークを介してネットワーク資源へのユーザ・アクセスを提供する方法５００の例を説明するフローチャートである。方法５００は、携帯電話を使用して企業ネットワークを介してネットワーク資源へのユーザ・アクセスを提供する方法の実例となる実施例に過ぎず、本発明の範囲を制限するようには意図されない。そのような方法の他の実施、例えば方法５００の変更、は可能であって、本発明の範囲内にあるように意図される。

【0060】

ステップ５０２において、例えば携帯電話スキャナ１１８に関して上述されたように、ゲスト・ユーザを識別する情報は、携帯電話から、例えば携帯電話のＳＩＭから読み取られる。ステップ５０４において、１つ以上のゲスト・アカウント証明書が、例えば、ゲスト・アクセス管理サーバ１２６に関して上述されるように、携帯電話から読み取られた情報に基づいて作成されてもよい。ステップ５０６において、例えば、ユーザ出力装置１１２に関して上述されるように、１つ以上のゲスト・アカウント証明書がゲスト・ユーザに示されてもよい（例えば、表示されてもよく、音声として再生されてもよい）。方法５００は追加のステップを含んでもよい。

【0061】

ゲスト・ユーザーのネットワーク・アクセスを提供するために本明細書に記載された実施例は、比較的単純で安全である。各々は、パートナー、顧客、ベンダー及び他の企業訪問者に対して容易なインターネットアクセスを提供する市場需要を満たす。これらのソリューションはコスト節約となり得るし、既存のネットワークインフラを使用するので、既知のソリューションと比べて、企業のＩＴ部門に付加するオーバーヘッドが小さい。ＩＴ部門は、新しいゲスト・ネットワークインフラを追加する代わりに、ゲストＶＬＡＮを維持する必要があるだけである。さらに、ゲストトラフィックと従業員トラフィックは分離することができる。さらに、ゲストの行動はログ及び監視することができ、ホスト企業に比較的セキュアなソリューションを提供する。本明細書に記述された実施例のいくつかのものは容易に料金請求する機構を提供し、企業は進んでこれらのソリューションを展開させることができる。

【0062】

方法２００－５００、これらのステップ並びにこれらの方法及びこれらのステップの様々な実施例及び変更は、個々にあるいは組合せとして、１つ以上のコンピュータ可読媒体、例えば不揮発性の記録媒体、集積回路メモリ要素、又はその組合せにおいて実態的に具体化されたコンピュータ可読信号によって定義されてもよい。コンピュータ可読媒体は、コンピュータによってアクセスすることができるあらゆる利用可能な媒体であり得る。限定ではなく例として、コンピュータ可読媒体には、コンピュータストレージ媒体と通信媒体とを含めることができる。コンピュータストレージ媒体には、コンピュータ可読命令、データ構造、プログラムモジュール、又はそれ以外のデータ等の情報の記憶のための任意の方法又は技術で実施される揮発性及び不揮発性の着脱可能及び着脱不能な媒体が含まれる。コンピュータストレージ媒体には、ＲＡＭ、ＲＯＭ、ＥＥＰＲＯＭ、フラッシュメモリ、又はそれ以外のメモリ技術、ＣＤ－ＲＯＭ、デジタル多用途ディスク（ＤＶＤ）、又はそれ以外の光ストレージ、磁気カセット、磁気テープ、磁気ディスクストレージ、又はそれ以外の磁気ストレージデバイス、それ以外のタイプの揮発性メモリ及び不揮発性メモリ、所望の情報を記憶するのに使用でき且つコンピュータがアクセスすることができるそれ以外の任意の媒体、及び上記のものの任意の適した組み合わせが含まれるが、これらに限定されるものではない。

【0063】

通信媒体は、通常、搬送波又はその他のトランスポート機構などの変調データ信号の形で、コンピュータ可読命令、データ構造、プログラム・モジュール又はその他のデータを具現化し、任意の情報配信媒体が含まれる。「変調データ信号」という用語は、信号の特性の内の１つ又は複数を、その信号内の情報を符合化するように設定又は変更した信号を意味する。一例であり、限定ではないが、通信媒体としては、有線ネットワーク又は直接配線接続（direct-wired connection）などの有線媒体、及び音響、ＲＦ、赤外線及びその他の無線媒体などの無線媒体、他の種類の通信媒体及びこれらの適切な組合せを含む。

【0064】

１つ又は複数のコンピュータ可読媒体に具体化されたコンピュータ可読信号 は、例えば、１つ又は複数のプログラムの一部として、コンピュータによる実行の結果として、そのコンピュータに、本明細書に記載の機能のうちの１つ又は複数（例えば、方法２００－５００又はその動作）及び／又は様々な実施形態、その変形形態、及び組合せを実行させる命令を定義することができる。そのような命令は、例えば、Ｊａｖａ（登録商標）、Ｊ＃、Ｖｉｓｕａｌ Ｂａｓｉｃ、Ｃ、Ｃ＃、又はＣ＋＋ 、Ｆｏｒｔｒａｎ、Ｐａｓｃａｌ、Ｅｉｆｆｅｌ、Ｂａｓｉｃ、ＣＯＢＯＬなどの、複数のプログラミング言語のいずれか又はこれらの様々な組合せのいずれかで記述することができる。そのような命令が具体化されたコンピュータ可読媒体は、本明細書に記載のシステム１００及び６００のいずれかのコンポーネントのうちの１つ又は複数に存在することができ、そのようなコンポーネントのうちの１つ又は複数に渡って分散させることができ、それらの間で移行中とすることができる。

【0065】

コンピュータ可読媒体は、可搬性のものとすることができ、それに格納された命令は、任意のコンピュータシステム資源にロードして、本明細書に記載の本発明の態様を実施することができる。さらに、上述したコンピュータ可読媒体に格納された命令が、ホストコンピュータで動作するアプリケーションプログラムの一部として具体化された命令に制限されないことを理解されたい。そうではなく、当該命令は、本発明の上述した態様を実施するようにプロセッサをプログラムするのに使用することができる任意のタイプのコンピュータコード（例えば、ソフトウェア又はマイクロコード）として具体化することができる。

【0066】

本明細書に記載の機能を実行する、例えば図１、６及び７に関して記載されるコンピュータシステムのいずれかなどの、コンピュータシステムの単一のコンポーネント又は複数のコンポーネントの集合のいずれも、一般に、そのような機能を制御する１つ又は複数のコントローラと考えることができることを理解されたい。１つ又は複数のコントローラは、専用のハードウェア及び／又はファームウェアを用いるなどして、上述の機能又は前述のものの任意の適当な組合せを実行するようにマイクロコード又はソフトウェアを使用してプログラムされたプロセッサを使用して、多数の形で実施することができる。

【0067】

本発明による様々な実施形態は、１つ又は複数のコンピュータシステムで実施することができる。これらのコンピュータシステムは、例えば、Ｉｎｔｅｌ ＰＥＮＴＩＵＭ（登録商標）タイププロセッサ、Ｍｏｔｏｒｏｌａ ＰｏｗｅｒＰＣ、Ｓｕｎ ＵｌｔｒａＳＰＡＲＣ、Ｈｅｗｌｅｔｔ－Ｐａｃｋａｒｄ ＰＡ－ＲＩＳＣプロセッサ、ＡＭＤ（Ａｄｖａｎｃｅｄ Ｍｉｃｒｏ Ｄｅｖｉｃｅｓ）社から入手可能な様々なプロセッサのいずれか、又は任意の他のタイプのプロセッサに基づくものなどの、汎用コンピュータとすることができる。任意のタイプのコンピュータシステムのうちの１つ又は複数を使用して、本発明の様々な実施形態を実施できることを理解されたい。

【0068】

本発明の一実施形態による汎用コンピュータシステムは、上で説明した機能のうちの１つ又は複数を実行するように構成されている。このシステムが他の機能を実行できること、及び本発明がいずれかの特定の機能又は機能のセットを有することに制限されないこと

を理解されたい。

【0069】

例えば、本発明の様々な態様を、図６に示されたものなどの汎用コンピュータシステム６００で実行される特殊化されたソフトウェアとして実施することができる。コンピュータシステム６００は、ディスクドライブ、メモリ、又はデータを格納する他のデバイスなどの、１つ又は複数のメモリデバイス６０４に接続されたプロセッサ６０３を含むことができる。メモリ６０４は、通常、コンピュータシステム６００の動作中にプログラム及びデータを格納するのに使用される。コンピュータシステム６００のコンポーネントを、相互接続機構６０５によって結合することができ、相互接続機構６０５は、１つ又は複数のバス（例えば、同一のマシン内で一体化されたコンポーネントの間）及び／又はネットワーク（例えば、別々の別個のマシンに存在するコンポーネントの間）を含むことができる。相互接続機構６０５は、通信（例えば、データ、命令）をシステム６００のシステムコンポーネントの間で交換できるようにする。コンピュータシステム６００は、例えば、キーボード、マウス、トラックボール、マイクロホン、タッチスクリーンなどの１つ又は複数の入力デバイス６０２、及び、例えば印刷デバイス、ディスプレイスクリーン、スピーカなどの、１つ又は複数の出力デバイス６０１も含む。さらに、コンピュータシステム６００は、コンピュータシステム６００を通信ネットワークに接続する（相互接続機構６０５に加えて又はこれの代わりに）１つ又は複数のインタフェース（図示せず）を含むことができる。

【0070】

図６により詳細に示されるストレージシステム７０６は、通常、コンピュータによって読み取り可能かつ書き込み可能な不揮発性記録媒体７０１を含み、この不揮発性記録媒体７０１に、プロセッサによって実行されるプログラムを定義する信号が格納され、あるいは、そのプログラムによって処理される情報が格納される。この媒体は、例えば、ディスク又はフラッシュメモリとすることができる。通常、動作時に、プロセッサはデータを不揮発性記録媒体７０１から別のメモリ７０２に読み取らせ、これによって、プロセッサによる情報への媒体７０１より高速のアクセスを可能にする。このメモリ７０２は、通常は、ダイナミックランダムアクセスメモリ（ＤＲＡＭ）又はスタティックメモリ（ＳＲＡＭ）などの揮発性ランダムアクセスメモリである。これは、図示のようにストレージシステム６０６に置くか、図示されていないメモリシステム６０４に置くことができる。プロセッサ６０３は、一般に、集積回路メモリ６０４及び７０２内のデータを操作し、次に、処理が完了した後にそのデータを媒体７０１にコピーする。媒体７０１と集積回路メモリ要素６０４及び７０２との間のデータ移動を管理する様々な機構が既知であり、本発明はそれに制限されない。本発明は、特定のメモリシステム６０４又はストレージシステム６０６に制限されない。

【0071】

コンピュータシステムは、例えば特定用途向け集積回路（ＡＳＩＣ）などの、特別にプログラムされた特殊目的ハードウェアを含むことができる。本発明の諸態様は、ソフトウェア、ハードウェアもしくはファームウェア、又はその任意の組合せで実施することができる。さらに、そのような方法、動作、システム、システム要素、及びそのコンポーネントは、上で説明したコンピュータシステムの一部として又は独立のコンポーネントとして実装することができる。

【0072】

コンピュータシステム６００は例として、本発明の様々な態様を実施できるコンピュータシステムの１タイプとして示されているが、本発明の諸態様が、図６に示されたコンピュータシステムで実施されることに制限されないことを理解されたい。本発明の様々な態様は、図６に示されたものと異なるアーキテクチャ又はコンポーネントを有する１つ又は複数のコンピュータで実践することができる。

【0073】

コンピュータシステム６００は、高水準コンピュータプログラミング言語を使用してプ

ログラム可能な汎用コンピュータシステムとすることができる。コンピュータシステム６００は、特別にプログラムされた特殊目的ハードウェアを使用して実施することもできる。コンピュータシステム６００内で、プロセッサ６０３は、通常、Ｉｎｔｅｌ Ｃｏｒｐｏｒａｔｉｏｎから入手可能な周知のＰｅｎｔｉｕｍ（登録商標）クラスプロセッサなどの市販プロセッサである。多数の他のプロセッサが使用可能である。そのようなプロセッサは、通常、オペレーティングシステムを実行し、オペレーティングシステムは、例えば、Ｍｉｃｒｏｓｏｆｔ（登録商標） Ｃｏｒｐｏｒａｔｉｏｎから入手可能なＷｉｎｄｏｗｓ（登録商標）９５、Ｗｉｎｄｏｗｓ（登録商標）９８、Ｗｉｎｄｏｗｓ（登録商標）ＮＴ（登録商標）、Ｗｉｎｄｏｗｓ（登録商標）２０００（Ｗｉｎｄｏｗｓ（登録商標）ＭＥ）、又はＷｉｎｄｏｗｓ（登録商標）ＸＰオペレーティングシステム、Ａｐｐｌｅ Ｃｏｍｐｕｔｅｒ社から入手可能なMAC OS System X、Ｓｕｎ Ｍｉｃｒｏｓｙｓｔｅｍｓ社から入手可能なＳｏｌａｒｉｓ Ｏｐｅｒａｔｉｎｇ Ｓｙｓｔｅｍ、様々なソースから入手可能なＬｉｎｕｘ、又は様々なソースから入手可能なＵＮＩＸ（登録商標）などとすることができる。様々な他のオペレーティングシステムのいずれであっても、使用することができる。

【0074】

プロセッサ及びオペレーティングシステムが、一緒に、高水準プログラミング言語のアプリケーションプログラムが記述されるコンピュータプラットフォームを定義する。本発明が特定のコンピュータシステムプラットフォーム、プロセッサ、オペレーティングシステム、又はネットワークに制限されないことを理解されたい。また、本発明が特定のプログラミング言語又はコンピュータシステムに制限されないこと、及び他の適当なプログラミング言語及び他の適当なコンピュータシステムも使用できることは、当業者に明白であるだろう。

【0075】

コンピュータシステムの１つ又は複数の部分を、通信ネットワークに結合された１つ又は複数のコンピュータシステム（図示せず）にわたって分散させることができる。これらのコンピュータシステムも、汎用コンピュータシステムとすることができる。例えば、本発明の様々な態様を、１つ又は複数のクライアントコンピュータにサービスを提供するように構成された１つ又は複数のコンピュータシステム（例えば、サーバ）、又は分散システムの一部として全体的なタスクを実行するように構成された１つ又は複数のコンピュータシステムの間で分散させることができる。例えば、本発明の様々な態様を、本発明の様々な実施形態に従って様々な機能を実行する１つ又は複数のサーバシステムの間で分散されたコンポーネントを含むクライアントーサーバシステムで実行することができる。これらのコンポーネントは、通信プロトコル（例えば、ＴＣＰ／ＩＰ）を使用して通信ネットワーク（例えば、インターネット）上で通信する実行可能コード、中間（ｉｎｔｅｒｍｅｄｉａｔｅ）（例えば、ＩＬ）コード、又は解釈済み（ｉｎｔｅｒｐｒｅｔｅｄ）（例えば、Ｊａｖａ（登録商標））コードとすることができる。

【0076】

本発明が特定のシステム又はシステムのグループで実行されることに制限されないこと、及び本発明が特定の分散アーキテクチャ、ネットワーク、又は通信プロトコルに制限されないことを理解されたい。

【0077】

本発明の様々な実施形態を、ＳｍａｌｌＴａｌｋ、Ｊａｖａ（登録商標）、Ｊ＃（Ｊシャープ）、Ｃ＋＋ 、Ａｄａ、又はＣ＃（Ｃシャープ）などのオブジェクト指向プログラミング言語を使用してプログラムすることができる。他のオブジェクト指向プログラミング言語も使用することができる。あるいは、機能プログラミング言語、スクリプトプログラミング言語、及び／又は論理プログラミング言語を使用することができる。本発明の様々な態様を、非プログラム式（ｎｏｎ－ｐｒｏｇｒａｍｍｅｄ）環境（例えば、ブラウザプログラムのウィンドウで表示された時に、グラフィカルユーザインタフェース（ＧＵＩ）の諸態様をレンダリングするか他の機能を実行する、ＨＴＭＬ、ＸＭＬ、又は他のフォ

ーマットで作成された文書）で実施することができる。本発明の様々な態様を、プログラム式要素又は非プログラム式要素、あるいはその任意の組合せとして実施することができる。さらに、本発明の様々な実施形態を、Ｍｉｃｒｏｓｏｆｔ（登録商標）　Ｃｏｒｐｏｒａｔｉｏｎから入手可能なＭｉｃｒｏｓｏｆｔ（登録商標）．ＮＥＴテクノロジを使用して実施することができる。

【0078】

本発明のいくつかの例示的な実施形態を説明したが、前述したものは単に例示的であって制限的ではなく、例としてのみ提示されたことが、当業者には明白であろう。多数の修正形態及び他の例示的実施形態が、当業者の範囲内であり、本発明の範囲に含まれることが意図されている。具体的には、本明細書で提示された例の多くが、方法動作又はシステム要素の特定の組合せを用いるが、これらの動作及びこれらの要素を異なる形で組み合わせて、同一の目的を達成できることを理解されたい。一実施形態に関してのみ説明された動作、要素、及び特徴は、他の実施形態における類似する役割から除外されることを意図されていない。さらに、請求項に記載の１つ又は複数の特定の機能を実行する手段の範囲の制限に関して、手段は、記載された機能を実行するための、本明細書で開示された手段に制限されることを意図されているのではなく、記載された機能を実行する、現在既知の又は後に開発される任意の同等の手段を範囲に含むことが意図されている。

【0079】

「第１の」、「第２の」、「第３の」などの順序を示す語を請求項要素を限定するために請求項において使用すること自体は、別の請求項要素に対するある請求項要素の優先、優位、又は順序、あるいは方法の動作が実行される時間的順序を暗示するのではなく、単に、ある名前を有するある請求項要素を（順序を示す単語の使用を除いて）同一の名前を有する別の要素から区別し、請求項要素を区別するための符号として使用されている。

【図面の簡単な説明】

【0080】

【図1】本発明のいくつかの実施例による、ホスト企業ネットワークを介してネットワーク資源へゲスト・ユーザがアクセスすることを可能にするシステムの例を説明するブロック図である。

【図2】本発明のいくつかの実施例による、企業ネットワークを介してネットワーク資源へゲスト・ユーザがアクセスすることを可能にする方法の例を説明するフローチャートである。

【図3】本発明のいくつかの実施例による、ゲスト・アクセス・カードを使用して、企業ネットワークを介してネットワーク資源へゲスト・ユーザがアクセスすることを可能にする方法の例を説明するフローチャートである。

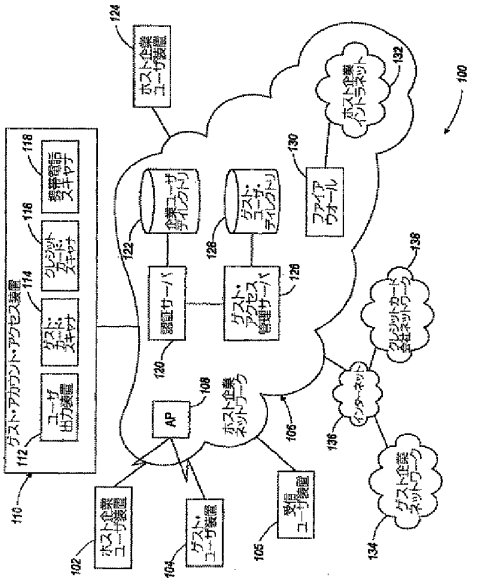
【図4】本発明のいくつかの実施例による、クレジットカードを使用して、企業ネットワークを介してネットワーク資源へユーザがアクセスすることを可能にする方法の例を説明するフローチャートである。

【図5】本発明のいくつかの実施例による、携帯電話を使用して、企業ネットワークを介してネットワーク資源へのユーザのアクセスを提供する方法の例を説明するフローチャートである。

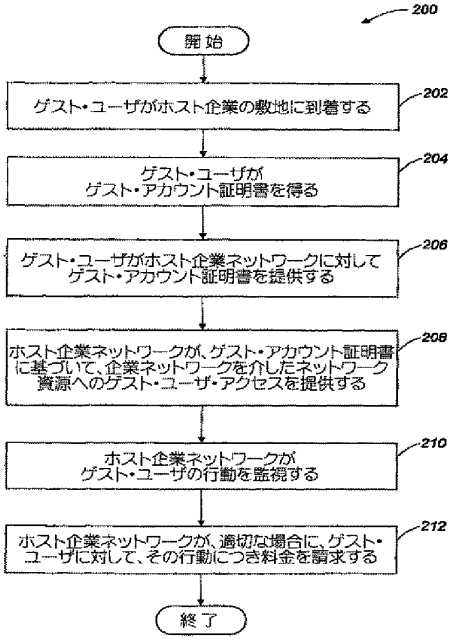
【図6】本発明のいくつかの実施例を実施することができるコンピュータ・システムの例を説明するブロック図である。

【図7】本発明のいくつかの実施例を実施するためのコンピュータ・システムの一部として使用することができるストレージ・システムの例を説明するブロック図である。

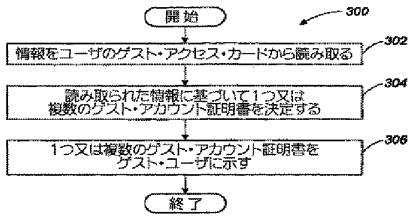
【図1】



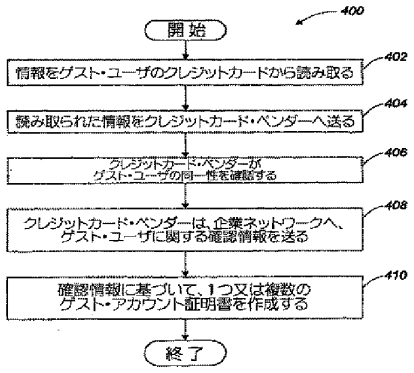

【図2】



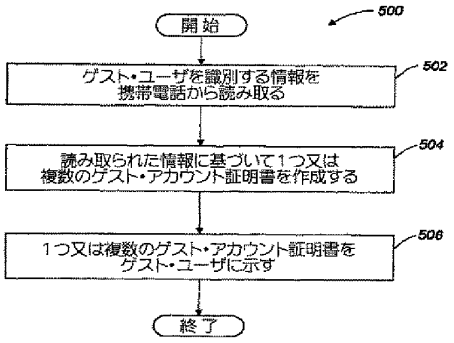

【図3】



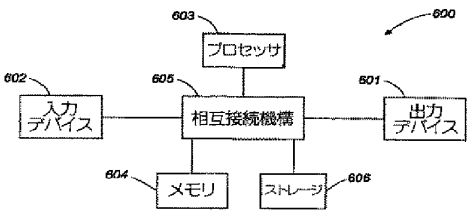

【図4】



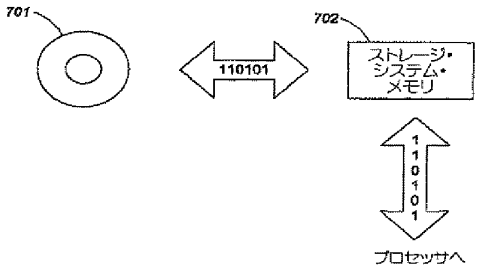

【図5】




【図6】



【図7】



**INTERNATIONAL SEARCH REPORT**

International application No.
**PCT/US2007/010570**

**A. CLASSIFICATION OF SUBJECT MATTER**

***G06Q 20/00(2006.01)i, G06Q 40/00(2006.01)i***

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

**B. FIELDS SEARCHED**

Minimum documentation searched (classification system followed by classification symbols)
IPC 8 G06Q 20/00; G06Q 40/00; H04L 9/08

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched
Korean utility models and applications for utility models since 1975.
Japanese utility models and applications for utility models since 1975.

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)
e-KIPASS "network resource, access control, access card, guest account credential, VLAN, virtual LAN"

**C. DOCUMENTS CONSIDERED TO BE RELEVANT**

| Category* | Citation of document, with indication, where appropriate, of the relevant passages | Relevant to claim No. |
|---|---|---|
| Y | US 20040248557 A1 (Muratsu, Fumitake) 9 DECEMBER 2004<br>See Abstract; Claim 1; Figure 1 | 1-20 |
| Y | US 20040210450 A1 (Atencio, Michael et al.) 21 OCTOBER 2004<br>See Abstract; Paragraph 0101; Figure 1a | 1-20 |
| Y | KR 1020050026624 A (Lee, Sang Joon) 15 MARCH 2005<br>See Abstract; Page 6, Lines 49-52; Page 8, Lines 15-16; Figures 2,7 | 1-20 |
| Y | US 06577628 B1 (Hejza, Leo A) 10 JUNE 2003<br>See Abstract; Claims 1,11,17,20 | 1-20 |

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

* Special categories of cited documents:
"A" document defining the general state of the art which is not considered to be of particular relevance
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"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents,such combination being obvious to a person skilled in the art
"&" document member of the same patent family

| Date of the actual completion of the international search | Date of mailing of the international search report |
|---|---|
| 08 NOVEMBER 2007 (08.11.2007) | **08 NOVEMBER 2007 (08.11.2007)** |
| Name and mailing address of the ISA/KR<br>Korean Intellectual Property Office<br>920 Dunsan-dong, Seo-gu, Daejeon 302-701,<br>Republic of Korea<br>Facsimile No. 82-42-472-7140 | Authorized officer<br>DOO, So Young<br>Telephone No. 82-42-481-8378 |

Form PCT/ISA/210 (second sheet) (April 2007)

**INTERNATIONAL SEARCH REPORT**
Information on patent family members

International application No.
**PCT/US2007/010570**

| Patent document cited in search report | Publication date | Patent family member(s) | Publication date |
|---|---|---|---|
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| | | KR1020040104937 | 13.12.2004 |
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| | | US7200362BB | 03.04.2007 |
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| KR102005026624A | 15.03.2005 | NONE | |
| US06577628B1 | 10.06.2003 | NONE | |

Form PCT/ISA/210 (patent family annex) (April 2007)

(81)指定国　　AP(BW,GH,GM,KE,LS,MW,MZ,NA,SD,SL,SZ,TZ,UG,ZM,ZW),EA(AM,AZ,BY,KG,KZ,MD,RU,TJ,TM),EP(AT,BE,BG,CH,CY,CZ,DE,DK,EE,ES,FI,FR,GB,GR,HU,IE,IS,IT,LT,LU,LV,MC,MT,NL,PL,PT,RO,SE,SI,SK,TR),OA(BF,BJ,CF,CG,CI,CM,GA,GN,GQ,GW,ML,MR,NE,SN,TD,TG),AE,AG,AL,AM,AT,AU,AZ,BA,BB,BG,BH,BR,BW,BY,BZ,CA,CH,CN,CO,CR,CU,CZ,DE,DK,DM,DZ,EC,EE,EG,ES,FI,GB,GD,GE,GH,GM,GT,HN,HR,HU,ID,IL,IN,IS,JP,KE,KG,KM,KN,KP,KR,KZ,LA,LC,LK,LR,LS,LT,LU,LY,MA,MD,ME,MG,MK,MN,MW,MX,MY,MZ,NA,NG,NI,NO,NZ,OM,PG,PH,PL,PT,RO,RS,RU,SC,SD,SE,SG,SK,SL,SM,SV,SY,TJ,TM,TN,TR,TT,TZ,UA,UG,US,UZ,VC,VN,ZA,ZM,ZW

（特許庁注：以下のものは登録商標）
１．ＧＳＭ
２．ＥＥＰＲＯＭ
３．Ｌｉｎｕｘ

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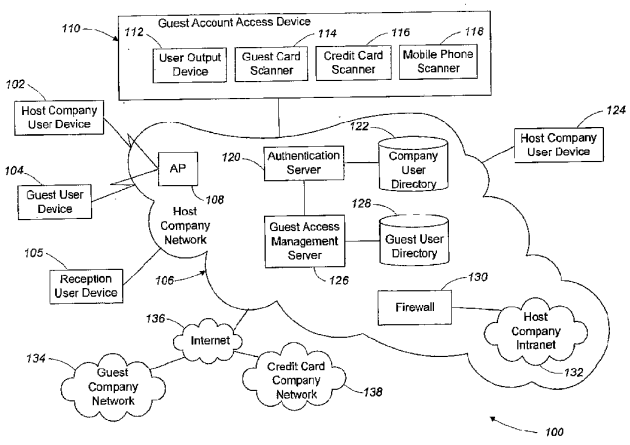
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(54) Title: PROVIDING GUEST USERS ACCESS TO NETWORK RESOURCES THROUGH AN ENTERPRISE NETWORK




(57) Abstract: Guest user are enabled to access network resources through an enterprise network using a guest user account. A guest user account may be created for a guest for a limited time. Guest account credentials of the guest account may be provided to the guest to use the guest account using any of a variety of techniques described herein, for example, by scanning a guest access card, credit card or mobile telephone of guest user, and providing the guest account credentials to the user based on the information obtained. A guest access management server may be configured to generate and maintain guest accounts, authenticate guest users, and track and log guest activity. A VLAN technology may be used to separate guest traffic from host enterprise traffic on the host enterprise network. After a guest user is authenticated, communications to and from the guest user may be routed to a guest VLAN.

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# PROVIDING GUEST USERS ACCESS TO NETWORK RESOURCES THROUGH AN ENTERPRISE NETWORK

## BACKGROUND

In today's world, enterprises often serve as hosts to visitors, for example, vendors, partners, clients, members, colleagues, students, etc., for any of a variety of purposes. These guests often desire to access the Internet or another network (e.g., the networks of their own enterprises) using their mobile user devices, such as, for example, laptop computers, notebook computers, telephones, Blackberry™ brand devices, PCS devices, personal digital assistance (PDAs), etc. Thus, host enterprises often provide guests access to network resources through the host enterprise's network. As used herein, enterprises include, but are not limited to: companies; corporations; partnerships; sole proprietorships, other types of business entities; organizations; non-profit organizations; governmental bodies and/or agencies; educational institutions; other types of enterprises; and any suitable combination of the foregoing.

Providing guests access to network resources (e.g., a portion of the host network, the Internet, a guest enterprise network, etc.) often requires the use of dedicated hardware and/or software, and the installment and the maintenance of same. These dedicated solutions are not simple. Most require information technology (IT) support and/or the assistance of one or more administrators or receptionists. Thus, in order to provide guests with access to network resources, host enterprises typically incur the costs of dedicated hardware and/or software, IT support, and/or administrative assistance.

## SUMMARY

This Summary provides an illustrative context for aspects of the invention, in a simplified form. It is not intended to be used to determine the scope of the claimed subject matter. Aspects of the invention are described more fully below in the Detailed Description.

Described herein are systems and methods enabling guests to access network resources through an enterprise network using a guest user account. A guest user account may be created for a guest for a limited time (a day, a couple days, certain times during certain days (e.g., 9:00 a.m. to 5:00 p.m.), a week, or even longer). Guest account

credentials (e.g., a guest account ID and password) of the guest account may be provided to the guest, which allow the guest to use the guest account. Any of a variety of techniques, including those described herein, may be used to provide the guest account credentials to the user. Providing the credentials may involve obtaining information from the guest user, and providing guest access credentials in response to obtaining the information. Obtaining the information about the guest user may include scanning a guest access card, credit card or mobile telephone of the guest user, receiving an email or letter, or orally in person or by telephone. A guest access management server may be configured to generate and maintain guest accounts, authenticate guest users, and track and log guest activity.

In some embodiments, virtual LAN (i.e., VLAN) technology may be used to separate guest traffic from host enterprise traffic on the host enterprise network. By using VLAN technology, the host enterprise's existing network infrastructure may be used, as opposed to having to modify the infrastructure. After a guest user is authenticated, communications to and from the guest user may be routed to a guest VLAN. Within the guest VLAN, the user may be allowed to access network resources such as the Internet or the guest enterprise's network.

In an embodiment of the invention, a guest user to enabled to access network resources through an enterprise network. Information read from an object (e.g., a credit card, a guest access card, a mobile telephone, etc.) in the possession of the guest user. is received. One or more guest account credentials for accessing the network resources through the enterprise network are determined based on the read information, and the one or more guest account credentials are indicated to the guest user.

In another embodiment, a system is provided for enabling a guest user to access network resources through an enterprise network. The system includes a guest access management server to determine, based on the information read from an object (e.g., a credit card, a guest access card, a mobile telephone, etc.) in the possession of the guest user, one or more guest account credentials for accessing the network resources through the enterprise network, and to initiate an indicating of the one or more guest account credentials to the guest user.

In yet another embodiment, a computer program product is provided, which includes a computer-readable medium and computer-readable signals stored on the computer-readable medium. The signals define instructions that, as a result of being

executed by a computer, control the computer to perform a method of a method of enabling a guest user to access network resources through an enterprise network. The method includes acts of: (a) receiving information read from a guest access card of the guest user; (b) determining, based on the read information, one or more guest account credentials for accessing the network resources through the enterprise network; and (c) indicating the one or more guest account credentials to the guest user.

In another embodiment, a guest user is enabled to access network resources through an enterprise network. Information from a credit card vendor verifying an identity of the guest user is received. One or more guest account credentials for accessing the network resources through the enterprise network are determined based on the received information, and the one or more guest account credentials are indicated to the guest user.

In another embodiment, a system is provided for enabling a guest user access to network resources through an enterprise network. The system includes a guest access management server to receive information from a credit card vendor verifying an identity of the guest user, to determine, based on the received information, one or more guest account credentials for accessing the network resources through the enterprise network, and to initiate an indication of the one or more guest account credentials to the guest user.

In yet another embodiment, a user is enabled to access network resources through an enterprise network. At a server of a credit card vendor, information read from a credit card of the user by a credit card scanner on premises of the enterprise is received. An identity of the user is verified based on the received information, and verification information about the user is sent to a guest access server of the enterprise, the guest access server being responsible for guest user access to network resources through a network of the entity.

In another embodiment, system is provided to enable a guest user to access network resources through an enterprise network. The system includes a server of a credit card vendor, operative to receive information read from a credit card of the user by a credit card scanner on premises of the enterprise, to verify an identity of the user based on the received information, and to send verification information about the user to a guest access server of the enterprise, the guest access server being responsible for guest user access to network resources through a network of the enterprise.

Other advantages, novel features, and objects of the invention, and aspects and embodiments thereof, will become apparent from the following detailed description of the invention, including aspects and embodiments thereof, when considered in conjunction with the accompanying drawings, which are schematic and which are not intended to be drawn to scale. In the figures, each identical or nearly identical component that is illustrated in various figures is represented by a single numeral. For purposes of clarity, not every component is labeled in every figure, nor is every component of each embodiment or aspect of the invention shown where illustration is not necessary to allow those of ordinary skill in the art to understand the invention.

## BRIEF DESCRIPTION OF THE DRAWINGS

Fig. 1 is a block diagram illustrating an example of a system for enabling a guest user to access network resources through a host enterprise network, according to some embodiments of the invention;

Fig. 2 is a flow chart illustrating an example of a method of enabling a guest user to access network resources through an enterprise network, according to some embodiments of the invention;

Fig. 3 is a flowchart illustrating an example of a method of enabling a guest user to access network resources through an enterprise network using a guest access card, according to some embodiments of the invention;

Fig. 4 is a flowchart illustrating an example of a method of enabling a user to access network resource through an enterprise network using a credit card, according to some embodiments of the invention;

Fig. 5 is a flowchart illustrating an example of a method of providing a user access to network resources through an enterprise network using a mobile telephone, according to some embodiments of the invention;

Fig. 6 is a block diagram illustrating an example of a computer system on which some embodiments of the invention may be implemented; and

Fig. 7 is a block diagram illustrating an example of a storage system that may be used as part of the computer system to implement some embodiments of the invention.

## DETAILED DESCRIPTION

Although embodiments of the invention are described below in relation to providing guest users wireless access to network resources through a host enterprise network, the invention is not so limited, but rather, may be implemented for non-wireless (e.g., wireline) access.

The function and advantage of the above embodiments and other embodiments of the present invention will be more fully understood from the examples described below. The following examples are intended to facilitate a better understanding and illustrate the benefits of the present invention, but do not exemplify the full scope of the invention.

As used herein, whether in the written description or the claims, the terms "comprising", "including", "carrying", "having", "containing", "involving", and the like are to be understood to be open-ended, i.e., to mean including but not limited to. Only the transitional phrases "consisting of" and "consisting essentially of", respectively, shall be closed or semi-closed transitional phrases, as set forth, with respect to claims, in the United States Patent Office Manual of Patent Examining Procedures (Eighth Edition, Revision 2, May 2004), Section 2111.03.

Examples

In some embodiments, a guest user is granted guest access through a host enterprise using a guest access card issued by the host enterprise. Prior to, or at the time of, the guest's arrival at the host enterprise, the guest may be provided a guest access card. The guest access card may encode (in clear text or encrypted form) guest account credentials for a guest account, such as, for example, a guest access ID and password, or may encode a value that is associated with a guest account and/or guest account credentials. Guest account credentials and/or other information may be stored on a magnetic strip or in semiconductor memory on the guest access card.

Upon arrival at the host enterprise (e.g., a lobby or reception area), the guest user may attempt to access network resources (e.g., the Internet and/or the guest's corporate network) using a user device (e.g., a laptop or PDA) and may be prompted for guest account credentials (e.g., a guest account ID and password). Prior to, during or after attempting to access network resources, the guest user may scan the guest access card (e.g., magnetically, optically or using RF technology) using a scanner on the host enterprise's premises (e.g., in a reception area or lobby), which may be specifically

designed for this purpose. A guest access management server on the host network may receive the scanned information and determine guest account credentials. This determination may be made simply by reading the guest account credentials provided by the guest access card, by decrypting encrypted account information on the card or by mapping information provided by the card to a guest account ID and password. The guest account credentials may be sent to a device capable of indicating them to the guest user, for example, a device in the vicinity of the guest user and/or scanner. Such a device may be or include any of the following: a display device (e.g., a monitor); a printer; a device that produces badges and/or ID cards, a speaker; a telephone; another type of device; or any suitable combination of the foregoing.

The guest user then may log into the host enterprise network using the guest credentials, for example, using a user device (e.g., a laptop or PDA). The host enterprise network may be configured to limit guest user access, for example, to the Internet and/or the guest's enterprise network. For example, the host enterprise network may employ virtual local area network (VLAN) technologies to limit the guest's access based on the guest access account of the guest user. The host enterprise network then may monitor the network activity of the guest and, if necessary, bill the guest user for access to particular network resources such as, for example, the Internet.

Further, the guest account may be configured to have a limited duration such as, for example, a certain (e.g., predefined) number of hours, days, weeks, months, or a combination thereof. The guest account may further be configured for use only during specific times within the limited duration, for example, from 9:00 a.m. to 5:00 p.m. over a three-day duration.

In some embodiments of the invention, rather than using a guest access card issued by the host enterprise, the guest user may use a credit card issued by a credit card vendor such as, for example, Visa, MasterCard, American Express, Discover, etc., to obtain access to network resources through a host enterprise's network. Prior to, during or after attempting to access network resources using a laptop or other user device, the guest user may scan the credit card using a scanner on the host enterprise's premises. Information resulting from the scan may be sent to a network of the credit card enterprise, which may verify the identity of the guest user. The credit card enterprise then may send verification information about the guest user to the host enterprise network, for example, to a guest access management server on the host enterprise

network. In response to receiving the verification information, a guest access management server may generate a guest account and guest account credentials, and send the credentials to a device that indicates (e.g., displays) them to the guest user (e.g., as described above). The guest user can then use the credentials to log into the host enterprise network. The guest's access to network resources may be limited and the guest's activity may be monitored and billed, for example, as described above. Further, the duration and specific times of access using the guest account also may be limited.

In some embodiments, rather than using a guest access card or existing credit card, the guest user may use a mobile telephone to obtain access to network resources through a host enterprise's network. Using a mobile telephone scanner provided on the host enterprise's site, the guest user may scan information stored on the guest's mobile telephone, for example, on a subscriber identity module (SIM) card of the mobile telephone. This information may be sent to the guest access management server, which may generate a guest account and guest account credentials in response to receiving the scanned information. The guest account credentials may be sent to a device and indicated (e.g., displayed) to the user, for example, as described above. Using a laptop or other user device, the guest user then may access the network resources through the host enterprise network by entering the guest credentials. Similar to as described above, the guest user's access may be limited to certain network resources, and to a certain duration and specific times within the duration, and the activities of the guest user may be monitored and billed as appropriate.

In some embodiments, a guest user may be provided guest account credentials before arriving at the host enterprise, or a receptionist or another administrator at the guest enterprise may provide the guest account credentials to the guest user upon the guest's arrival. In such embodiments, the guest user may simply log into the network using the guest account credentials without having to first scan a guest card, credit card, mobile telephone or other item.

Fig. 1 is a block diagram illustrating an example of a system 100 for enabling a guest user to access network resources through a host enterprise network, according to some embodiments of the invention. System 100 is merely an illustrative embodiment of a system for enabling a guest user to access network resources through a host enterprise network, and is not intended to limit the scope of the invention. Any of numerous of

implementation to such a system, for example, variations of system 100, are possible and are intended to fall within the scope of the invention.

System 100 may include any of: one or more host enterprise user devices (e.g., 102 and 124); one or more guest user devices (e.g., 104); one or more reception user devices (e.g., 105); one or more guest account access devices (e.g., 110); a host enterprise network 106; the Internet 136; one or more guest enterprise networks (e.g., 134); one or more credit card enterprise networks (e.g., 138); and any suitable combination of the foregoing.

As used herein, a "network" is a group of two or more components interconnected by one or more segments of transmission media over which communications may be exchanged between the components. Each segment may be any of a plurality of types of transmission media, including one or more electrical or optical wires or cables made of metal and/or optical fiber, air (e.g., using wireless transmission over carrier waves) or any combination of these transmission media. As used herein, "plurality" means two or more. It should be appreciated that a network may be as simple as two components connected by a single wire, bus, wireless connection, or other type of segment. Further, it should be appreciated that when a network is illustrated in a drawing of this application as being connected to an element in the drawing, the connected element itself is considered part of the network.

As used herein, a "network device" is a device operative to communicate on a network, including, but not limited to: workstations, personal computers, terminals, laptop computers, end stations, user devices, servers, gateways, registers, switches, routers, hubs, bridges, directories, transmitters, receivers, transceivers, wireless access points (APs), repeaters, and any combinations thereof. As used herein, a "user device" is a network device from/to which a user may send/receive communications, and which may serve as an endpoint to communications on a communications network. User devices include, but are not limited to: workstations; personal computers (e.g., PCs); laptop computers, notebook computers; telephones (e.g., landline or mobile); pagers; Blackberry™ brand devices, PCS devices, personal digital assistants (PDAs), smartphones, two-way radios (e.g., "walkie-talkies"), other types of user devices, and any suitable combination of the foregoing.

A network (e.g., any of networks 106, 132, 134, 136 and 138) may be or include any of a variety of types of networks including, but not limited to, a local area network

(LAN), a metropolitan area network (MAN), a wide-area network (WAN), a wireless network, a Public Land Mobile Network (PLMN), a Global System for Mobile Communications (GSM) network, a General Packet Radio Service (GPRS) network, a Universal Mobile Telecommunications System (UMTS) network, a Code-Division Multiple Access (CDMA) network, an optical network, a data network, an enterprise-wide network, a wireless personal area network (PAN), a home network, a telecommunications network, a public switched telephone network (PSTN), a broadband network, another type of network, or any suitable combination of the foregoing.

Host enterprise network 106 may include one or more network devices of any of the types described above and may include any of: one or more wireless access points (APs) (e.g., 108), one or more authentication servers (e.g., 120); one or more enterprise user directories (e.g., 122); one or more guest access management servers (e.g., 126); one or more guest user directories (e.g., 128); one or more firewalls (e.g., 130); a host enterprise Intranet (132); other network devices; or any suitable combination of the foregoing.

One or more components of host enterprise network 106 such as, for example, routers, switches and/or combination thereof (not shown) may be configured to define one or more VLANs. One or more of these VLANs (i.e., a guest VLAN) may be defined to include one or more guest access accounts and one or more network resources. The one or more network resources included within a guest VLAN may include the Internet, a guest enterprise network and perhaps one or more network resources residing on host network 106, so that guest users are limited to accessing only these resources. One or more other VLANs may be associated with host enterprise users (e.g., employees and officers). These host enterprise VLANs should be defined to include more resources on host enterprise network 106 than guest VLANs, thus providing enterprise users access to more resources on the enterprise network than guest users, who may be given access to no resources on the enterprise network. For example, the host enterprise VLAN may be configured to include host enterprise Intranet 132.

AP 108 may be configured to provide wireless access to host enterprise network 106 for user devices, including host enterprise user devices (e.g., 102 and 124) and guest user devices (e.g., 104). AP 108 may be configured to pass user credentials received from a user device to authentication server 120. Authentication server 120 may be configured to determine whether the user credentials identify a host enterprise user, for

example, by accessing enterprise user directory 122. If the user credentials identify a user as an authorized user of a host enterprise, the user may be given access to resources of host enterprise network 106, according to one or more VLANs to which the user belongs.

If the authentication server 120 determines that user credentials provided by a user device are not those of a host enterprise user, the authentication server 120 may pass the user credentials to guest access management server 126. Alternatively, server 126 may receive the credentials from AP 108 without first going through authentication server 120. Server 126 may determine whether the user credentials identify a guest user, for example, by accessing guest user directory 128. If the user credentials identify the user as a guest user, the guest user may be provided access only to those network resources to which members of the guest VLAN are permitted access.

In some embodiments of the invention, a user device (e.g., any of 102, 104 or 124) may be configured to discover any networks in the vicinity of the user device, for example, by establishing communications with an AP in the vicinity of the user device. For example, a user device may include an operating system (e.g., one of the operating systems available from Microsoft Corporation, specified below) configured to discover networks in its vicinity, e.g., in response to the operating system being launched when the user device is booted (i.e., powered on). If the user device is a host enterprise user device (e.g., 102), then the user device may be permitted to exchange information with host enterprise network 106 based on previous communications exchanged between the user device and an AP. For example, the operating system of the host enterprise user device may automatically provide user credentials previously exchanged between the user device and the AP to establish connectivity.

The AP and/or the guest user device may be configured to recognize when a guest user device has not previously been authenticated. In such cases, the operating system of the guest user device may be configured to prompt the user for guest account credentials (i.e., a guest account ID and a password). The guest user device may only be permitted access to the host enterprise network by providing valid guest user credentials.

In some embodiments of the invention, the user of the guest user device may be provided guest account credentials prior to arriving on the premises of the host enterprise (e.g., by email, paper mail, telephone, etc.), or upon arrival on the premises by a receptionist or other administrator. For example, upon arrival, a receptionist or other

administrator may use reception user device 105 to contact guest access management server 106 to obtain guest account credentials.

Obtaining guest account credentials prior to arrival on the enterprise premises may be desirable when a large amount of guest users will be visiting the host enterprise. In such situations, an IT staff or administrator from the host enterprise can use the guest access management server 126 to import information for all of the guests who will be visiting the host enterprise. Such information may include names, job titles, the length of time for which guest access will be necessary, etc.. The guest access management server 126 may provide different guest account credentials for each future guest. Upon arrival on the host enterprise premises, each guest user may log onto the host enterprise network 106 through AP 108 or another access point, using the previously provided guest account credentials. The guest access management server 126 then may authenticate each of the guest users, for example, by comparing the user credentials provided with those stored in guest user directory 128.

In some embodiments of the invention, guest users acquire guest user credentials after they arrive on the host enterprise premises, for example, through the use of a guest account access device such as device 110. Device 110 may include any of: user output device 112; guest card scanner 114; credit card scanner 116; mobile telephone scanner 118; other components; and any suitable combination of the foregoing. It should be appreciated that one or more of user output device 112, guest card scanner 114, credit card scanner 116 and mobile telephone scanner 118 may reside on separate guest account access devices, and that one or more of these components may be integrated as a single component.

User output device 112 may include one or more of any type of output device suitable to display information to a user, for example, a monitor, printer or badge-generating device, or to indicate information to the user in some other manner (e.g., through audio), for example, a speaker or telephone. It should be appreciated that user output device 112 is not limited to being part of guest account access device 110, but may be separate and distinct from device 112.

Guest card scanner 114 may be configured to scan a guest card provided by a guest user. A guest card may have guest account credentials, or a value mapping to an account encoded thereon, for example, in clear text or encrypted format. The guest access card may store information on a magnetic strip, a semiconductor memory or on

some other form of media. Further, the guest access card may include a transmitter or other means for transmitting/receiving signals and/or information. The guest access card scanner 114 may be configured with one or more components (e.g., heads) to read magnetically-stored information and/or with a receiver or transceiver for receiving information transmitted from a guest card. Further, scanner 114 may be configured to send information scanned from a guest access card to guest access management server 126, for example, across one or more segments of host enterprise network 106.

Credit card scanner 116 may be configured with one or more components (e.g., heads) to scan a credit card and send the scanned information to the appropriate credit card enterprise network (e.g., 138) and/or a component of host enterprise network 106 (e.g., guest access management server 126) configured to send the information along to the credit card enterprise network 138.

In some embodiments of the invention, the host enterprise has a partnership with one or more credit card enterprises. The host enterprise may pay a certain amount of money for each enterprise's validation service. If the host enterprise needs to charge the guest access, a credit card enterprise can charge for access on the credit card.

It should be appreciated that, in some embodiments, scanners 114 and 116 may be integrated as part of a same device, and the same components may be used to read information from guest access cards and credit cards. In such embodiments, the scanning device may be configured to determine from the scanned information (e.g., it's format and/or content) whether the card scanned is a credit card or a guest access card, and to proceed accordingly. For example, the scanning device may send the scanned information to the guest access management server 126 if it determines the card scanned is a guest access card, and may send the scanned information to the appropriate credit card vendor otherwise.

Mobile telephone scanner 118 may be configured to read information about a mobile telephone user from a guest user's mobile telephone, for example, from a SIM card of a user's mobile telephone. The mobile telephone scanner 118 may be configured to read this information electromagnetically and/or optically from the mobile telephone, and to send the information about the user to the guest access management server 126.

Guest access management server 126 may be configured to receive: guest account credentials (e.g., a guest account ID and password) in clear text or encrypted form; information corresponding to guest account credentials; information corresponding

to a user, other information, or any suitable combination of the foregoing. In response to receiving such information, server 126 may determine guest account credentials and provide them to one or more other network components such as, for example, user output device 112. For example, guest access management server 126 may be configured to receive verification information about a user from credit enterprise network 138, information about a mobile telephone user from mobile telephone scanner 118 and/or guest account credentials for information corresponding to guest account credentials from guest card scanner 114.

Server 126 may be configured to determine guest account credentials included in information it receives (e.g., from guest card scanner 114) and/or create guest account credentials in response to user information or user verification information it receives from mobile telephone scanner 118 and credit card enterprise network 138, respectively. The guest access management server 126 may store guest account credentials in guest user directory 128, and use these credentials to authenticate guest users.

System 100, and components thereof, may be implemented using any of a variety of technologies, including software (e.g., C, C#, C++, Java, or a combination thereof), hardware (e.g., one or more application-specific integrated circuits), firmware (e.g., electrically-programmed memory) or any combination thereof. One or more of the components of system 100 may reside on a single device (e.g., a computer), or one or more components may reside on separate, discrete devices. Further, each component may be distributed across multiple devices, and one or more of the devices may be interconnected.

Further, on each of the one or more devices that include one or more components of system 100, each of the components may reside in one or more locations on the system. For example, different portions of the components of these systems may reside in different areas of memory (e.g., RAM, ROM, disk, etc.) on the device. Each of such one or more devices may include, among other components, a plurality of known components such as one or more processors, a memory system, a disk storage system, one or more network interfaces, and one or more busses or other internal communication links interconnecting the various components. System 100, and components thereof, may be implemented using a computer system such as that described below in relation to Figs. 6 and 7.

Fig. 2 is a flow chart illustrating an example of a method 200 of enabling a guest user (e.g., a user of guest user device 104) to access network resources through an enterprise network (e.g., network 106), according to some embodiments of the invention. Method 200 is merely an illustrative embodiment of a method of enabling a guest user to access network resources through an enterprise network, and is not intended to limit the scope of the invention. Any of numerous other implementations of such a method, for example, variations of method 200, are possible and are intended to fall within the scope of the invention.

In Act 202, a guest user arrives at the premises of an enterprise, for example, in the reception area or a lobby of the enterprise offices. In Act 204, the user may acquire one or more guest account credentials, for example, as described below in relation to Figs. 3-5. It should be appreciated that, in some embodiments, the guest account credentials may be acquired before the guest user arrives on the premises of the host enterprise, as described above.

In Act 206, the guest user may provide the guest account credentials to an enterprise network. For example, the guest user may enter the guest account credentials through a user device (e.g., device 105), for example, in response to prompts. These guest account credentials may be passed to an authentication component of the network such as, for example, guest access management server 126.

In Act 208, the enterprise network may provide the guest user access to network resources through the enterprise network based on the guest account credentials. For example, the guest account credentials may be passed to the guest access management server 126, which may verify the credentials using guest user directory 128. If the guest account credentials are authenticated, the guest may be provided access to network resources such as, for example, the Internet 136, the guest enterprise network 134, and perhaps resources on host enterprise network 106 itself. Access to these network resources may be regulated using VLAN technologies. That is, one or more VLANs may be defined that include the Internet and the guest enterprise network, a limited amount of resources of network 106, and/or one or more guest accounts. One or more components on host enterprise network 106 (e.g., routers, switches, or suitable combinations thereof) may be configured to control access to network resources defined for one or more such VLANs based on the guest account ID provided by a guest user. Other technologies may be used to regulate guest user access.

In Act 210, the host enterprise network may monitor activities of the guest user, for example, the network resources that it accesses and/or with which it exchanges communications. In Act 212, the host enterprise network may bill the guest user for certain activities, for example, accessing particular network resources such as, for example, Internet.

The guest account provided for the guest user may be configured to be of limited duration and for use only during specific times during this duration. For example, the user account may be configured to be for use during a three day period (e.g., Monday-Wednesday) only during business hours, e.g., 9:00 am - 5:00 pm. Accordingly, the guest management access server and the network components responsible for routing traffic on the host enterprise network may be configured to deny access to the guest user when the duration of the guest account expires and when the guest user attempts to access network resources outside of the specific times designated for guest access. The guest access management server and these other components may be configured to do so based on the guest account credentials provided by the guest user when logging in and/or when transmitting packets on the guest enterprise network. An entry (e.g. record) for the guest account in guest user directory 128 may include one or more information elements that specify the duration and/or specific access times for a guest access account.

Method 200 may include additional acts. Further, the order of the acts performed as part of method 200 is not limited to the order illustrated in Fig. 2, as the acts may be performed in other orders and/or one or more of the acts may be performed in series or in parallel, at least partially. For example, Act 204 may be performed before Act 202 and Acts 210 and 212 may be performed in parallel, at least partially.

Fig. 3 is a flowchart illustrating an example of a method 300 of enabling a guest user to access network resources through an enterprise network using a guest access card, according to some embodiments of the invention. Method 300 is merely an illustrative embodiment of a method of enabling a user to access network resources through an enterprise network using a guest access card, and is not intended to limit the scope of the invention. Other implementations of such a method, for example, variations of method 300, are possible and are intended to fall within the scope of the invention.

In Act 302, information may be read from a guest access card of the user, for example, as described above in relation to guest card scanner 114. Next, in Act 304, based on the information read from the guest access card, one or more guest account

credentials may be determined, for example, as described above in relation to guest access management server 126. In Act 306, the one or more guest account credentials may be indicated (e.g., displayed or played as audio) to the guest user, for example, as described above in relation to user output device 112. Method 300 may include additional acts.

Fig. 4 is a flowchart illustrating an example of a method 400 of enabling a user to access network resources through an enterprise network using a credit card, according to some embodiments of the invention. Method 400 is merely an illustrative embodiment of a method of enabling a user to access network resources through an enterprise network using a credit card, and is not intended to limit the scope of the invention. Other implementations of such a method, for example, variations of method 400 are possible and are intended to fall within the scope of the invention.

In Act 402, information may be read from the credit card of the guest user, for example, as described above in relation to credit card scanner 116. In Act 404, the information read from the credit card may be sent to the credit card vendor, for example, credit card enterprise network 138 as described above, and the credit card enterprise may verify the identify of the guest user in Act 406. In Act 408, the credit card vendor may send verification information about the guest user to the enterprise network, for example, to guest access management server 126 as described above. In Act 410, one or more guest account credentials may be created based on the verification information, for example, as described above in relation to guest access management server 126. Method 400 may include additional acts.

Fig. 5 is a flowchart illustrating an example of a method 500 of providing a user access to network resources through an enterprise network using a mobile telephone, according to some embodiments of the invention. Method 500 is merely an illustrative embodiment of a method of providing a user access to network resources through an enterprise network using a mobile telephone, and is not intended to limit the scope of the invention. Other implementations of such a method, for example, variations of method 500 are possible and are intended to fall within the scope of the invention.

In Act 502, information that identifies the guest user is read from the mobile telephone, for example, from the SIM of the mobile telephone, e.g., as described above in relation to mobile telephone scanner 118. In Act 504, one or more guest account credentials may be created based on the information read from the mobile telephone, for

example, as described above in relation to guest access management server 126. In Act 506, the one or more guest account credentials may be indicated (e.g., displayed or played as audio) to the guest user, for example, as described above in relation to user output device 112. Method 500 may include additional acts.

The embodiments described herein for providing guest users network access are relatively simple and secure. Each meets the market demands of providing easy Internet access to partners, customers, vendors and other enterprise visitors. These solutions may be cost saving, and add less overhead to an enterprise's IT department than known solutions because they use existing network infrastructure. The IT department may only need to maintain a guest VLAN instead of adding a new guest network infrastructure. Further, guest traffic and employee traffic may be separated. Also, guest activities may be logged and monitored, providing a relatively secure solution for the host enterprise. Several of the embodiments described herein provide easy billing mechanisms, and enterprises may be willing to deploy these solutions.

Methods 200-500, and acts thereof, and various embodiments and variations of these methods and these acts, individually or in combination, may be defined by computer-readable signals tangibly embodied on one or more computer-readable media, for example, non-volatile recording media, integrated circuit memory elements, or a combination thereof. Computer readable media can be any available media that can be accessed by a computer. By way of example, and not limitation, computer readable media may comprise computer storage media and communication media. Computer storage media includes volatile and nonvolatile, removable and non-removable media implemented in any method or technology for storage of information such as computer readable instructions, data structures, program modules or other data. Computer storage media includes, but is not limited to, RAM, ROM, EEPROM, flash memory or other memory technology, CD-ROM, digital versatile disks (DVD) or other optical storage, magnetic cassettes, magnetic tape, magnetic disk storage or other magnetic storage devices, other types of volatile and non-volatile memory, any other medium which can be used to store the desired information and which can accessed by a computer, and any suitable combination of the foregoing.

Communication media typically embodies computer-readable instructions, data structures, program modules or other data in a modulated data signal such as a carrier wave or other transport mechanism and includes any information delivery media. The

term "modulated data signal" means a signal that has one or more of its characteristics set or changed in such a manner as to encode information in the signal. By way of example, and not limitation, communication media includes wired media such as a wired network or direct-wired connection, wireless media such as acoustic, RF, infrared and other wireless media, other types of communication media, and any suitable combination of the foregoing.

Computer-readable signals embodied on one or more computer-readable media may define instructions, for example, as part of one or more programs, that, as a result of being executed by a computer, instruct the computer to perform one or more of the functions described herein (e.g., methods 200-500 or any acts thereof), and/or various embodiments, variations and combinations thereof. Such instructions may be written in any of a plurality of programming languages, for example, Java, J#, Visual Basic, C, C#, or C++, Fortran, Pascal, Eiffel, Basic, COBOL, etc., or any of a variety of combinations thereof. The computer-readable media on which such instructions are embodied may reside on one or more of the components of any of systems 100, 600 and 600 described herein, may be distributed across one or more of such components, and may be in transition therebetween.

The computer-readable media may be transportable such that the instructions stored thereon can be loaded onto any computer system resource to implement the aspects of the present invention discussed herein. In addition, it should be appreciated that the instructions stored on the computer-readable medium, described above, are not limited to instructions embodied as part of an application program running on a host computer. Rather, the instructions may be embodied as any type of computer code (e.g., software or microcode) that can be employed to program a processor to implement the above-discussed aspects of the present invention.

It should be appreciated that any single component or collection of multiple components of a computer system, for example, any of the computer systems described in relation to Figs. 1, 6 and 7, that perform the functions described herein can be generically considered as one or more controllers that control such functions. The one or more controllers can be implemented in numerous ways, such as with dedicated hardware and/or firmware, using a processor that is programmed using microcode or software to perform the functions recited above or any suitable combination of the foregoing.

Various embodiments according to the invention may be implemented on one or more computer systems. These computer systems, may be, for example, general-purpose computers such as those based on Intel PENTIUM-type processor, Motorola PowerPC, Sun UltraSPARC, Hewlett-Packard PA-RISC processors, any of a variety of processors available from Advanced Micro Devices (AMD) or any other type of processor. It should be appreciated that one or more of any type of computer system may be used to implement various embodiments of the invention.

A general-purpose computer system according to one embodiment of the invention is configured to perform one or more of the functions described above. It should be appreciated that the system may perform other functions and the invention is not limited to having any particular function or set of functions.

For example, various aspects of the invention may be implemented as specialized software executing in a general-purpose computer system 600 such as that shown in Fig. 6. The computer system 600 may include a processor 603 connected to one or more memory devices 604, such as a disk drive, memory, or other device for storing data. Memory 604 is typically used for storing programs and data during operation of the computer system 600. Components of computer system 600 may be coupled by an interconnection mechanism 605, which may include one or more busses (e.g., between components that are integrated within a same machine) and/or a network (e.g., between components that reside on separate discrete machines). The interconnection mechanism 605 enables communications (e.g., data, instructions) to be exchanged between system components of system 600. Computer system 600 also includes one or more input devices 602, for example, a keyboard, mouse, trackball, microphone, touch screen, and one or more output devices 601, for example, a printing device, display screen, speaker. In addition, computer system 600 may contain one or more interfaces (not shown) that connect computer system 600 to a communication network (in addition or as an alternative to the interconnection mechanism 605).

The storage system 706, shown in greater detail in Fig. 6, typically includes a computer readable and writeable nonvolatile recording medium 701 in which signals are stored that define a program to be executed by the processor or information stored on or in the medium 701 to be processed by the program. The medium may, for example, be a disk or flash memory. Typically, in operation, the processor causes data to be read from the nonvolatile recording medium 701 into another memory 702 that allows for faster

access to the information by the processor than does the medium 701. This memory 702 is typically a volatile, random access memory such as a dynamic random access memory (DRAM) or static memory (SRAM). It may be located in storage system 606, as shown, or in memory system 604, not shown. The processor 603 generally manipulates the data within the integrated circuit memory 604, 702 and then copies the data to the medium 701 after processing is completed. A variety of mechanisms are known for managing data movement between the medium 701 and the integrated circuit memory element 604, 702, and the invention is not limited thereto. The invention is not limited to a particular memory system 604 or storage system 606.

The computer system may include specially-programmed, special-purpose hardware, for example, an application-specific integrated circuit (ASIC). Aspects of the invention may be implemented in software, hardware or firmware, or any combination thereof. Further, such methods, acts, systems, system elements and components thereof may be implemented as part of the computer system described above or as an independent component.

Although computer system 600 is shown by way of example as one type of computer system upon which various aspects of the invention may be practiced, it should be appreciated that aspects of the invention are not limited to being implemented on the computer system shown in Fig. 6. Various aspects of the invention may be practiced on one or more computers having a different architecture or components that that shown in Fig. 6.

Computer system 600 may be a general-purpose computer system that is programmable using a high-level computer programming language. Computer system 600 also may be implemented using specially-programmed, special-purpose hardware. In computer system 600, processor 603 is typically a commercially available processor such as the well-known Pentium class processor available from the Intel Corporation. Many other processors are available. Such a processor usually executes an operating system which may be, for example, the Windows® 95, Windows® 98, Windows NT®, Windows® 2000 (Windows® ME) or Windows® XP operating systems available from the Microsoft Corporation, MAC OS System X available from Apple Computer, the Solaris Operating System available from Sun Microsystems, Linux available from various sources or UNIX available from various sources. Any of a variety of other operating systems may be used.

The processor and operating system together define a computer platform for which application programs in high-level programming languages are written. It should be understood that the invention is not limited to a particular computer system platform, processor, operating system, or network. Also, it should be apparent to those skilled in the art that the present invention is not limited to a specific programming language or computer system, and that other appropriate programming languages and other appropriate computer systems could also be used.

One or more portions of the computer system may be distributed across one or more computer systems (not shown) coupled to a communications network. These computer systems also may be general-purpose computer systems. For example, various aspects of the invention may be distributed among one or more computer systems configured to provide a service (e.g., servers) to one or more client computers, or to perform an overall task as part of a distributed system. For example, various aspects of the invention may be performed on a client-server system that includes components distributed among one or more server systems that perform various functions according to various embodiments of the invention. These components may be executable, intermediate (e.g., IL) or interpreted (e.g., Java) code which communicate over a communication network (e.g., the Internet) using a communication protocol (e.g., TCP/IP).

It should be appreciated that the invention is not limited to executing on any particular system or group of systems, and that the invention is not limited to any particular distributed architecture, network, or communication protocol.

Various embodiments of the present invention may be programmed using an object-oriented programming language, such as SmallTalk, Java, J# (J-Sharp), C++, Ada, or C# (C-Sharp). Other object-oriented programming languages may also be used. Alternatively, functional, scripting, and/or logical programming languages may be used. Various aspects of the invention may be implemented in a non-programmed environment (e.g., documents created in HTML, XML or other format that, when viewed in a window of a browser program, render aspects of a graphical-user interface (GUI) or perform other functions). Various aspects of the invention may be implemented as programmed or non-programmed elements, or any combination thereof. Further, various embodiments of the invention may be implemented using Microsoft®.NET technology available from Microsoft Corporation.

Having now described some illustrative embodiments of the invention, it should be apparent to those skilled in the art that the foregoing is merely illustrative and not limiting, having been presented by way of example only. Numerous modifications and other illustrative embodiments are within the scope of one of ordinary skill in the art and are contemplated as falling within the scope of the invention. In particular, although many of the examples presented herein involve specific combinations of method acts or system elements, it should be understood that those acts and those elements may be combined in other ways to accomplish the same objectives. Acts, elements and features discussed only in connection with one embodiment are not intended to be excluded from a similar role in other embodiments. Further, for the one or more means-plus-function limitations recited in the following claims, the means are not intended to be limited to the means disclosed herein for performing the recited function, but are intended to cover in scope any equivalent means, known now or later developed, for performing the recited function.

Use of ordinal terms such as "first", "second", "third", etc., in the claims to modify a claim element does not by itself connote any priority, precedence, or order of one claim element over another or the temporal order in which acts of a method are performed, but are used merely as labels to distinguish one claim element having a certain name from another element having a same name (but for use of the ordinal term) to distinguish the claim elements.

What is claimed is:

## CLAIMS

1. A method of enabling a guest user to access network resources through an enterprise network, comprising acts of:

(a) receiving information read from an object in the possession of the guest user;

(b) determining, based on the read information, one or more guest account credentials for accessing the network resources through the enterprise network; and

(c) indicating the one or more guest account credentials to the guest user.

2. The method of claim 1, wherein the object is a guest access card.

3. The method of claim 1, wherein the object is a credit card.

4. The method of claim 1, wherein the object is a mobile telephone.

5. The method of claim 1, further comprising acts of:

(d) receiving the one or more guest account credentials from a user device of the guest user; and

(e) providing the guest user access to the network resources through the enterprise network based on the one or more guest account credentials.

6. The method of claim 5, wherein a guest account corresponding to the guest account credentials is configured to have a duration of a limited time, the method further comprising:

(f) denying the guest user access to the network resources after an expiration of the limited time.

7. The method of claim 5, wherein a guest account corresponding to the guest account credentials is configured to allow the guest user access to network resources only during one or more specific time intervals, the method further comprising an act of:

(f) denying the guest user access to the network resources outside of the one or more specific time intervals.

8. The method of claim 5, wherein the enterprise network is configured to define a plurality of virtual local area networks, including a first virtual local area network for guest users, and

wherein the act (e) comprises providing the guest user access to only network resources defined as part of the first virtual local area network.

9. The method of claim 8, wherein the first virtual local area network is defined to include the Internet.

10. The method of claim 1, wherein the act (b) comprises determining a guest account identity and password based on the read information, and

wherein the act (c) comprises indicating the guest account identity and password to the guest user.

11 The method of claim 10, wherein the act (a) comprises receiving the guest account identity and the password, which were read from the guest access card.

12. The method of claim 1, further comprising an act of:

(d) reading the information from the guest access card.

13. The method of claim 1, wherein the act (c) comprises displaying the one or more guest account credentials to the guest user.

14. A system for enabling a guest user to access network resources through an enterprise network, comprising:

a guest access management server to determine, based on the information read from an object in the possession of the guest user, one or more guest account credentials for accessing the network resources through the enterprise network, and to initiate an indicating of the one or more guest account credentials to the guest user.

15. The system of claim 14, wherein the object is one of the following: a guest access card; a credit card, or a mobile telephone.

16. The system of claim 14, further comprising:

a guest access account device to receive the information read from the object.

17. The system of claim 16, further comprising:

a user output device to indicate the one or more guest account credentials to the guest user.

18. The system of claim 14, wherein the guest access management server is operative to receive the one or more guest account credentials from a user device of the guest user, and to authorize access for the guest user access to the network resources through the enterprise network based on the one or more guest account credentials.

19. A computer program product comprising:

a computer-readable medium; and

computer-readable signals, stored on the computer-readable medium, that define instructions that, as a result of being executed by a computer, control the computer to perform a method of a method of enabling a guest user to access network resources through an enterprise network, the method comprising acts of:

(a) receiving information read from a guest access card of the guest user;

(b) determining, based on the read information, one or more guest account credentials for accessing the network resources through the enterprise network; and

(c) indicating the one or more guest account credentials to the guest user.

20. The computer-readable medium of claim 19, wherein the method further comprises acts of:

(d) receiving the one or more guest account credentials from a user device of the guest user; and

(e) providing the guest user access to the network resources through the enterprise network based on the one or more guest account credentials.

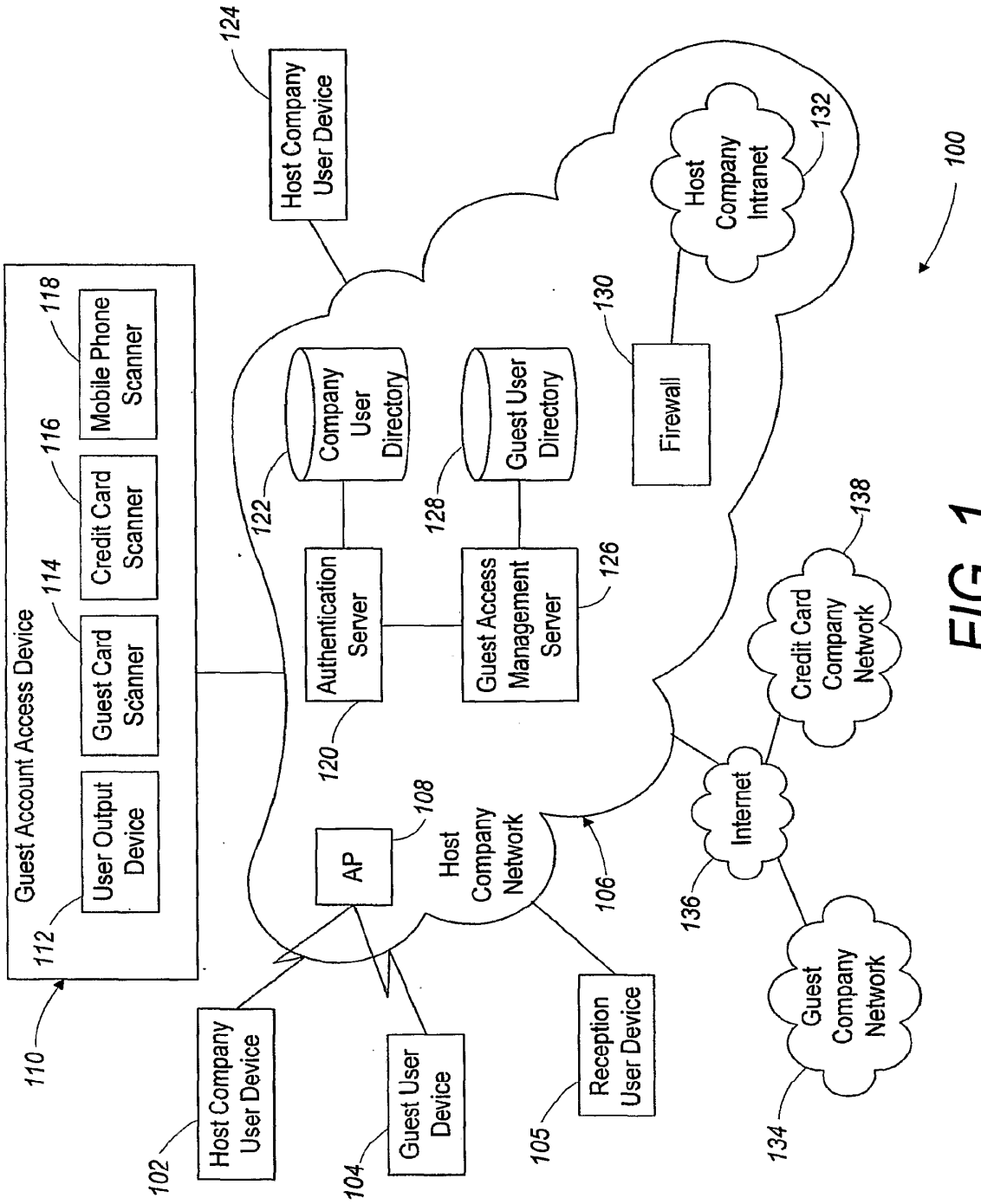

Guest Account Access Device
User Output Device
Guest Card Scanner
Credit Card Scanner
Mobile Phone Scanner
110
112
114
116
118
Host Company User Device
Guest User Device
Reception User Device
102
104
105
AP
108
Host Company Network
106
Authentication Server
120
Company User Directory
122
124
Guest Access Management Server
126
Guest User Directory
128
Firewall
130
Host Company Intranet
132
Internet
136
Credit Card Company Network
138
Guest Company Network
134
100

FIG. 1

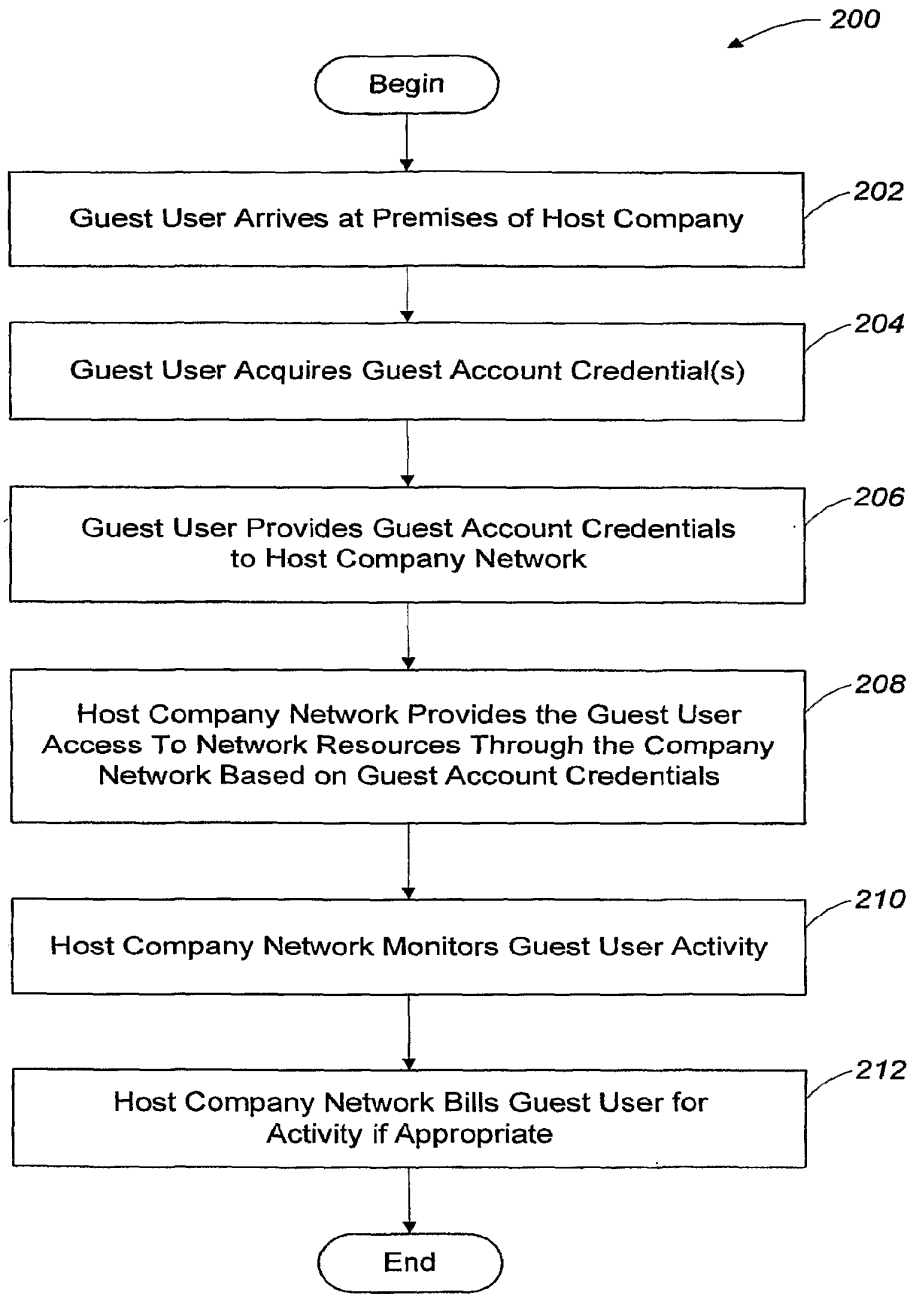

200
Begin
Guest User Arrives at Premises of Host Company
202
Guest User Acquires Guest Account Credential(s)
204
Guest User Provides Guest Account Credentials to Host Company Network
206
Host Company Network Provides the Guest User Access To Network Resources Through the Company Network Based on Guest Account Credentials
208
Host Company Network Monitors Guest User Activity
210
Host Company Network Bills Guest User for Activity if Appropriate
212
End

FIG. 2

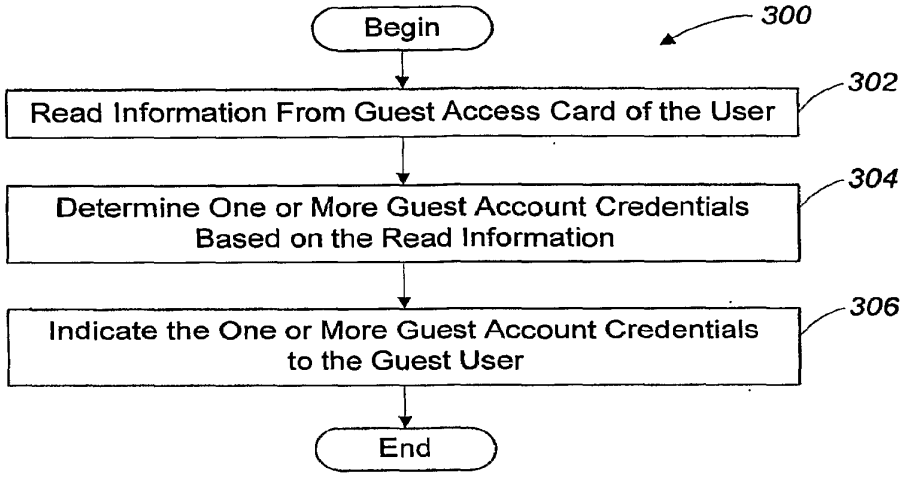

Begin
300
Read Information From Guest Access Card of the User
302
Determine One or More Guest Account Credentials Based on the Read Information
304
Indicate the One or More Guest Account Credentials to the Guest User
306
End

FIG. 3

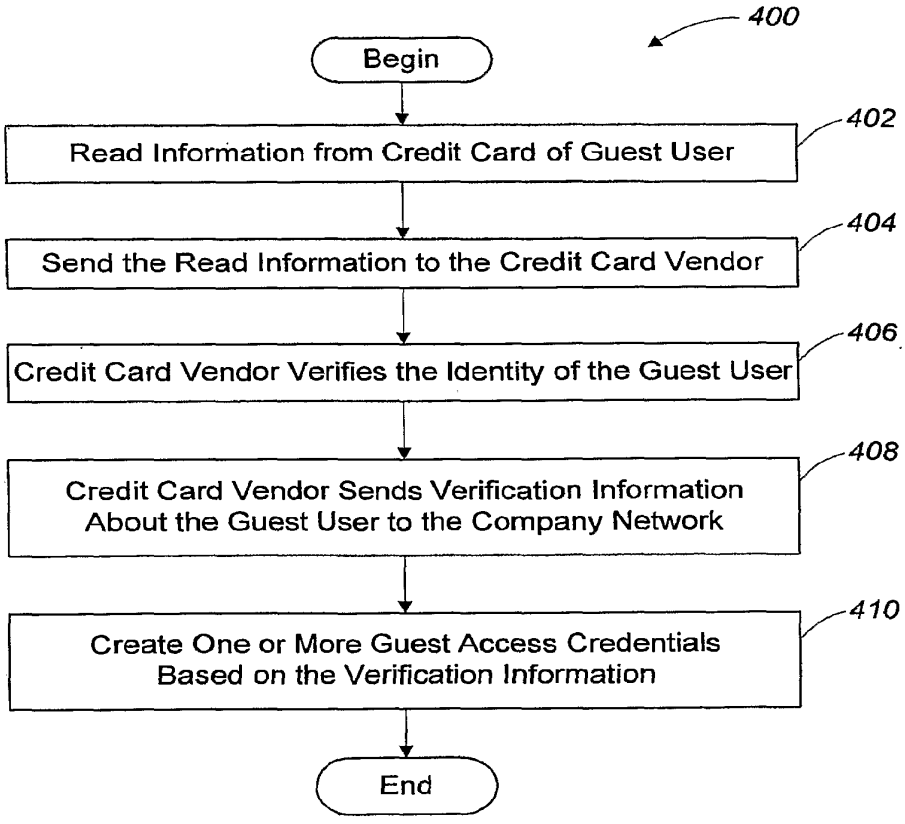

400
Begin
Read Information from Credit Card of Guest User
402
Send the Read Information to the Credit Card Vendor
404
Credit Card Vendor Verifies the Identity of the Guest User
406
Credit Card Vendor Sends Verification Information About the Guest User to the Company Network
408
Create One or More Guest Access Credentials Based on the Verification Information
410
End

FIG. 4

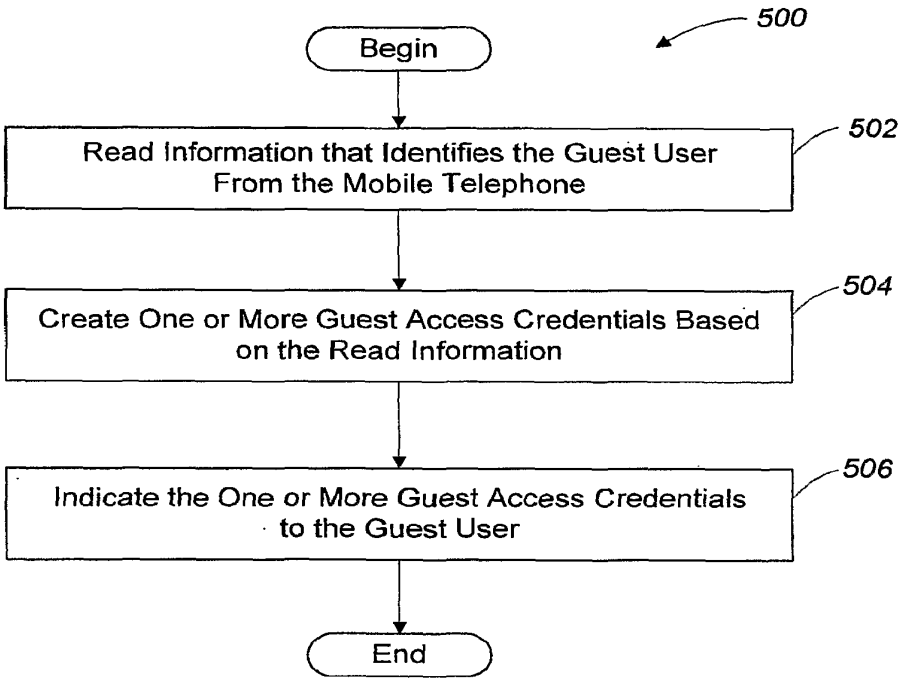

500
Begin
Read Information that Identifies the Guest User From the Mobile Telephone
502
Create One or More Guest Access Credentials Based on the Read Information
504
Indicate the One or More Guest Access Credentials to the Guest User
506
End

FIG. 5

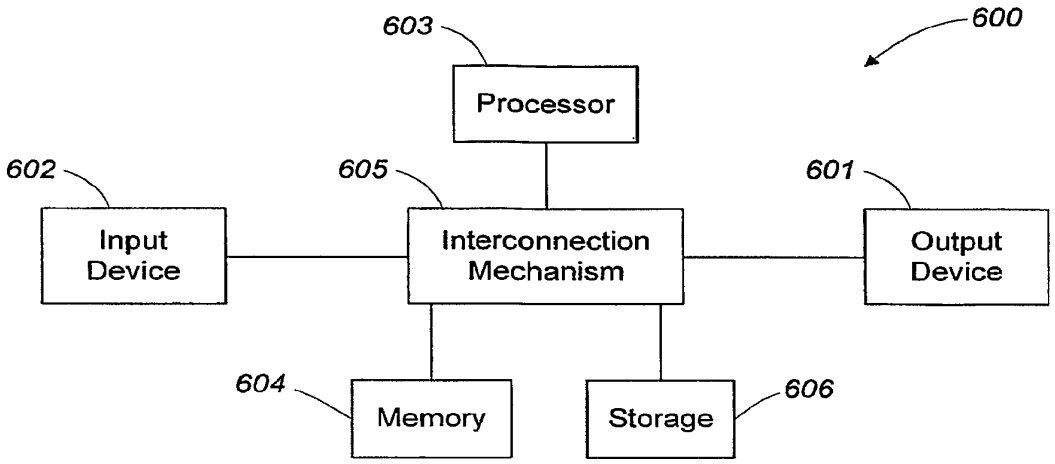

603
600
Processor
602
605
601
Input Device
Interconnection Mechanism
Output Device
604
606
Memory
Storage

FIG. 6

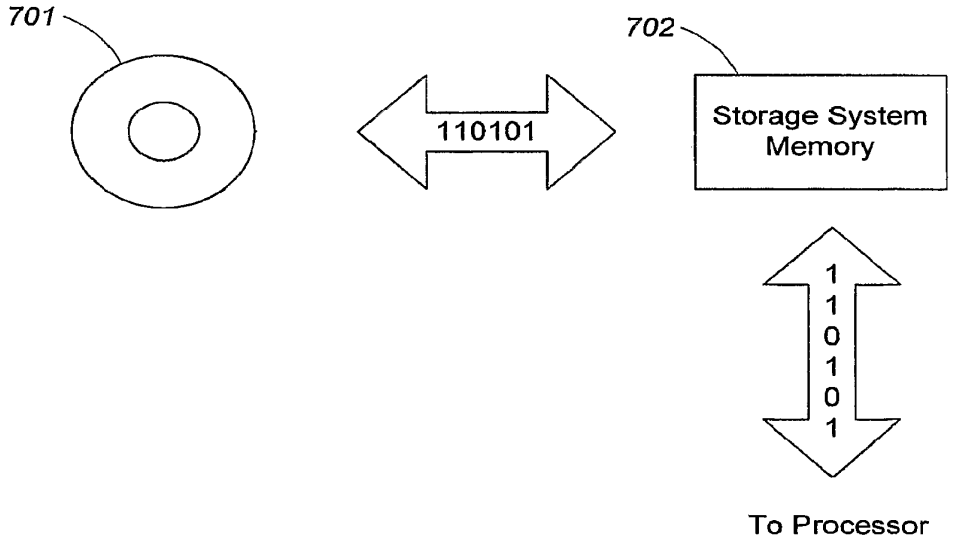

701
702
110101
Storage System Memory
1 1 0 1 0 1
To Processor

FIG. 7

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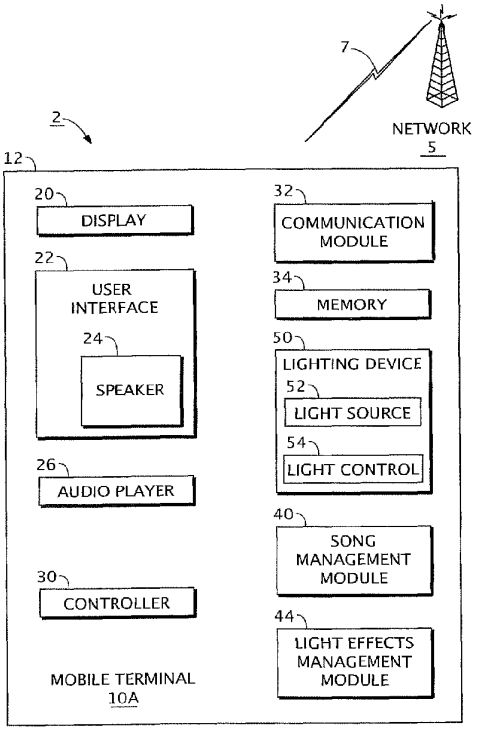
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*[Continued on next page]*

(54) Title: MOBILE WIRELESS COMMUNICATION TERMINALS, SYSTEMS, METHODS, AND COMPUTER PROGRAM PRODUCTS FOR MANAGING PLAYBACK OF SONG FILES




(57) Abstract: A mobile wireless communication terminal includes a wireless communication module that is configured to communicate with other communication terminals over a wireless interface, and a controller. The controller is configured to establish a connection with at least one participant wireless communication terminal via the wireless communication module, to receive from the at least one participant wireless communication terminal an identification of a compliant song file stored on the at least one participant wireless communication terminal and having a metadata tag associated therewith indicating that the compliant song file is classified in a prescribed song file category, and to execute playback of the compliant song file.

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# MOBILE WIRELESS COMMUNICATION TERMINALS, SYSTEMS, METHODS, AND COMPUTER PROGRAM PRODUCTS FOR MANAGING PLAYBACK OF SONG FILES

## FIELD OF THE INVENTION

**[001]** The present invention relates to electronic devices and, more particularly, to electronic devices, methods and computer program products for playing song files.

## BACKGROUND OF THE INVENTION

**[002]** Mobile electronic devices, such as wireless communication terminals (*e.g.*, cellular telephones), are widely used to store and playback song files. A user may wish to play a song file on another device such as a media center (*e.g.*, a PC or laptop, a television, an audio receiver, etc.) or another wireless communication terminal. This may be accomplished by connecting the electronic device to the other device via a cable or a wireless link (*e.g.*, a Bluetooth connection) if the other device is equipped with a suitable communication module, which may be an integrated module or an auxiliary (*e.g.*, plug- in) module. Song files may be sent, one by one, from one or more mobile electronic devices to the playback device(s).

## SUMMARY OF THE INVENTION

**[003]** According to some embodiments of the present invention, a mobile wireless communication terminal includes a wireless communication module that is configured to communicate with other communication terminals over a wireless interface, and a controller. The controller is configured to establish a connection with at least one participant wireless communication terminal via the wireless communication module, to receive from the at least one participant wireless communication terminal an identification of a compliant song file stored on the at least one participant wireless communication terminal and having a metadata tag associated therewith indicating that the compliant song file is classified in a prescribed song file category, and to execute playback of the compliant song file.

**[004]** The controller may be configured to establish a connection with a plurality of participant wireless communication terminals via the wireless communication module, and to receive identifications of compliant songs from at least two of the plurality of participant wireless communication terminals.

**[005]** According to some embodiments, the controller is configured to establish a connection with a plurality of participant wireless communication terminals via the wireless communication module, and to execute playback of the compliant song file simultaneously on the plurality of participant wireless communication terminals.

**[006]** The controller may be configured to retrieve the compliant song file from the at least one participant wireless communication terminal for playback.

**[007]** According to some embodiments of the present invention, the wireless communication module is configured to communicate with other communication terminals over a direct point-to-point wireless interface, and the controller is configured to establish the connection with the at least one participant wireless communication terminal via the wireless communication module via the direct point-to-point wireless interface, and to receive the identification of a compliant song file from the at least one participant wireless communication terminal via the direct point-to-point wireless interface. The wireless communication module may comprise a Bluetooth transmitter. The wireless communication terminal may include a cellular telephone.

**[008]** According to further embodiments of the present invention, a mobile wireless communication terminal includes a wireless communication module that is configured to communicate with other communication terminals over a wireless interface, and a controller. The controller is configured to establish a connection with at least one participant wireless communication terminal via the wireless communication module, to maintain a list of nominated song files, to receive at least one vote message from the at least one participant wireless communication terminal, to determine an elected song file from the list of nominated song files based on the at least one vote message, and to execute playback of the elected song file.

**[009]** According to some embodiments, the controller is configured to receive an identification of a nominated song file from the at least one participant wireless communication terminal, and to add the identification of the nominated song file to the list of nominated song files.

**[010]** According to some embodiments, the controller is configured to establish a connection with a plurality of participant wireless communication terminals via the wireless communication module, and to receive vote messages from at least two of the plurality of participant wireless communication terminals.

**[011]** The controller may be configured to establish a connection with a plurality of participant wireless communication terminals via the wireless communication module, and to execute playback of the elected song file simultaneously on the plurality of participant wireless communication terminals.

**[012]** The controller may be configured to retrieve the elected song file from the at least one participant wireless communication terminal for playback.

**[013]** According to some embodiments of the present invention, the wireless communication module is configured to communicate with other communication terminals over a direct point-to-point wireless interface, and the controller is configured to establish the connection with the at least one participant wireless communication terminal via the wireless communication module via the direct point-to-point wireless interface, and to receive the at least one vote message from the at least one participant wireless communication terminal via the direct point-to-point wireless interface. The wireless communication module may comprise a Bluetooth transmitter. The wireless communication terminal may include a cellular telephone.

**[014]** According to further embodiments of the present invention, a mobile wireless communication terminal includes a wireless communication module that is configured to communicate with other communication terminals over a wireless interface, and a controller. The controller is configured to establish a connection with at least one participant wireless communication terminal via the wireless communication module, and to send at least one light effect signal to the at least one participant wireless communication terminal instructing the at least one participant wireless communication terminal to control at least one lighting device of the at least one participant wireless communication terminal in correspondence with playback of a song file.

**[015]** According to some embodiments, the controller is configured to establish a connection with a plurality of participant wireless communication terminals via the wireless communication module, and to send light effect signals to each of the plurality of participant wireless communication terminals instructing each of the plurality of

participant wireless communication terminals to control a lighting device thereof in correspondence with playback of the song file.

**[016]** According to some embodiments, the controller may be configured to send light effect signals to each of the plurality of participant wireless communication terminals instructing the plurality of participant wireless communication terminals to control the lighting devices thereof differently from one another.

**[017]** The controller may be configured to send light effect signals to each of the plurality of participant wireless communication terminals so as to cause the plurality of participant wireless communication terminals to display on respective displays thereof an image that moves over time from the display of a first of the plurality of participant wireless communication terminals to the display of a second of the plurality of participant wireless communication terminals.

**[018]** According to some embodiments, the controller is configured to send light effect signals to each of the plurality of participant wireless communication terminals so as to cause a lighting device of a first of the plurality of participant wireless communication terminals to respond to audio signals in a first audio frequency range and to cause a lighting device of a second of the plurality of participant wireless communication terminals to respond to audio signals in a second audio frequency range different from the first audio frequency range.

**[019]** The controller may be configured to execute playback of the song file simultaneously on the plurality of participant wireless communication terminals.

**[020]** According to some embodiments, the wireless communication module is configured to communicate with other communication terminals over a direct point-to-point wireless interface, and the controller is configured to establish the connection with the at least one participant wireless communication terminal via the wireless communication module via the direct point-to-point wireless interface, and to send the at least one light effect signal to the at least one participant wireless communication terminal via the direct point-to-point wireless interface. The wireless communication module may comprise a Bluetooth transmitter. The wireless communication terminal may include a cellular telephone.

**[021]** Further features, advantages and details of the present invention will be appreciated by those of ordinary skill in the art from a reading of the figures and the

detailed description of the preferred embodiments that follow, such description being merely illustrative of the present invention.

## BRIEF DESCRIPTION OF THE DRAWINGS

**[022]** **Figure 1** is a schematic diagram of a mobile wireless communication terminal according to some embodiments of the present invention and an exemplary base station transceiver.

**[023]** **Figure 2** is a flowchart illustrating methods in accordance with some embodiments of the present invention.

**[024]** **Figure 3** is a schematic diagram of a song file playback system according to some embodiments of the present invention including the mobile wireless communication terminal of **Figure 1**.

**[025]** **Figure 4** is a schematic diagram of a song file playback system according to further embodiments of the present invention including the mobile wireless communication terminal of **Figure 1**.

**[026]** **Figure 5** is a schematic diagram of a song file playback system according to further embodiments of the present invention including the mobile wireless communication terminal of **Figure 1**.

**[027]** **Figure 6** is a schematic diagram illustrating a display of the mobile wireless communication terminal of **Figure 1** in accordance with some embodiments of the present invention.

**[028]** **Figure 7** is a flow chart illustrating methods in accordance with further embodiments of the present invention.

**[029]** **Figure 8** is a flow chart illustrating methods in accordance with further embodiments of the present invention.

**[030]** **Figure 9** is a schematic diagram of a song file playback system according to further embodiments of the present invention.

**[031]** **Figures 10A-C** are schematic diagrams of a system according to embodiments of the present invention illustrating an animation sequence displayed on three mobile wireless communication terminals of the system.

DETAILED DESCRIPTION OF EMBODIMENTS OF THE INVENTION

**[032]** The present invention now will be described more fully with reference to the accompanying drawings, in which embodiments of the invention are shown. However, this invention should not be construed as limited to the embodiments set forth herein. Rather, these embodiments are provided so that this disclosure will be thorough and complete, and will fully convey the scope of the invention to those skilled in the art. Like numbers refer to like elements throughout.

**[033]** As used herein, the term "comprising" or "comprises" is open-ended, and includes one or more stated features, integers, elements, steps, components or functions but does not preclude the presence or addition of one or more other features, integers, elements, steps, components, functions or groups thereof.

**[034]** As used herein, the term "and/or" includes any and all combinations of one or more of the associated listed items.

**[035]** As used herein, the common abbreviation "*e.g.*", which derives from the Latin phrase "exempli gratia," may be used to introduce or specify a general example or examples of a previously mentioned item, and is not intended to be limiting of such item. If used herein, the common abbreviation "*i.e.*", which derives from the Latin phrase "id est," may be used to specify a particular item from a more general recitation.

**[036]** The terminology used herein is for the purpose of describing particular embodiments only and is not intended to be limiting of the invention. As used herein, the singular forms "a", "an" and "the" are intended to include the plural forms as well, unless the context clearly indicates otherwise.

**[037]** Unless otherwise defined, all terms (including technical and scientific terms) used herein have the same meaning as commonly understood by one of ordinary skill in the art to which this invention belongs. It will be further understood that terms, such as those defined in commonly used dictionaries, should be interpreted as having a meaning that is consistent with their meaning in the context of the relevant art and will not be interpreted in an idealized or overly formal sense unless expressly so defined herein.

**[038]** It will be understood that when an element is referred to as being "coupled" or "connected" to another element, it can be directly coupled or connected to the other element or intervening elements may also be present. In contrast, when an element is referred to as being "directly coupled" or "directly connected" to another element, there

are no intervening elements present. Furthermore, "coupled" or "connected" as used herein may include wirelessly coupled or connected.

**[039]** Well-known functions or constructions may not be described in detail for brevity and/or clarity.

**[040]** The present invention may be embodied as methods, electronic devices, and/or computer program products. Accordingly, the present invention may be embodied in hardware and/or in software (including firmware, resident software, micro-code, *etc.*), which may be generally referred to herein as a "circuit" or "module". Furthermore, the present invention may take the form of a computer program product on a computer-usable or computer-readable storage medium having computer-usable or computer-readable program code embodied in the medium for use by or in connection with an instruction execution system. In the context of this document, a computer-usable or computer-readable medium may be any medium that can contain, store, communicate, propagate, or transport the program for use by or in connection with the instruction execution system, apparatus, or device.

**[041]** Embodiments according to the present invention are described with reference to block diagrams and/or operational illustrations of methods and communication terminals. In this regard, each block may represent a module, segment, or portion of code, which comprises one or more executable instructions for implementing the specified logical function(s). It is to be understood that each block of the block diagrams and/or operational illustrations, and combinations of blocks in the block diagrams and/or operational illustrations, can be implemented by radio frequency, analog and/or digital hardware, and/or program instructions. These program instructions may be provided to a controller, which may include one or more general purpose processors, special purpose processors, ASICs, and/or other programmable data processing apparatus, such that the instructions, which execute via the controller and/or other programmable data processing apparatus, create means for implementing the functions/acts specified in the block diagrams and/or operational block or blocks. In some alternate implementations, the functions/acts noted in the blocks may occur out of the order noted in the operational illustrations. For example, two blocks shown in succession may in fact be executed substantially concurrently or the blocks may sometimes be executed in the reverse order, depending upon the functionality/acts involved.

**[042]** These computer program instructions may also be stored in a computer-usable or computer-readable memory that may direct a computer or other programmable data processing apparatus to function in a particular manner, such that the instructions stored in the computer usable or computer-readable memory produce an article of manufacture including instructions that implement the function specified in the flowchart and/or block diagram block or blocks.

**[043]** The computer-usable or computer-readable medium may be, for example but not limited to, an electronic, magnetic, optical, electromagnetic, infrared, or semiconductor system, apparatus, device, or propagation medium. More specific examples (a nonexhaustive list) of the computer-readable medium include the following: hard disks, optical storage devices, a transmission media such as those supporting the Internet or an intranet, magnetic storage devices, an electrical connection having one or more wires, a portable computer diskette, a random access memory (RAM), a read-only memory (ROM), an erasable programmable read-only memory (EPROM or Flash memory), an optical fiber, and a compact disc read-only memory (CD-ROM).

**[044]** Computer program code for carrying out operations of the present invention may be written in an object oriented programming language such as Java®, Smalltalk or C++. However, the computer program code for carrying out operations of the present invention may also be written in conventional procedural programming languages, such as the "C" programming language and/or a lower level assembler language. It will be further appreciated that the functionality of any or all of the program modules may also be implemented using discrete hardware components, one or more application specific integrated circuits (ASICs), or a programmed digital signal processor or microcontroller.

**[045]** As used herein, "electronic component" means an active device as contrasted with a passive electrical connector or the like. An electronic component may include a processor.

**[046]** As used herein, "streamed" or "streaming" means that a file, such as an audio or song file, is continuously sent via a digital signal to a receiving device where the audio or song file is concurrently played via a suitable receiving application. The digital signal is typically buffered.

**[047]** As used herein, a "communication terminal" includes, but is not limited to, a terminal that is configured to receive/transmit communication signals via a wireline connection, such as via a public-switched telephone network (PSTN), digital subscriber

line (DSL), digital cable, or another data connection/network, and/or via a wireless interface with, for example, a cellular network, a satellite network, a wireless local area network (WLAN), and/or another communication terminal.

**[048]** When the communication terminal is configured to communicate over a wireless interface, it is referred to herein as a "wireless communication terminal" or a "wireless terminal." Examples of wireless terminals include, but are not limited to, a cellular telephone, personal data assistant (PDA), pager, and/or a computer that is configured to communicate data over a wireless communication interface that can include a cellular telephone interface, a Bluetooth interface, a wireless local area network interface (*e.g.*, 802.11), another RF communication interface, and/or an optical/infra-red communication interface.

**[049]** As used herein, "mobile terminals" may be portable, transportable, installed in a vehicle (aeronautical, maritime, or land-based), or situated and/or configured to operate locally and/or in a distributed fashion at any other location(s) on earth and/or in space.

**[050]** Referring now to **Figure 1**, an exemplary mobile wireless communication terminal **10A** in accordance with some embodiments of the present invention is illustrated. The wireless terminal **10A** is configured to communicate data with one or more other wireless terminals over a direct wireless communication interface therebetween, over another wireless communication interface through one or more cellular base stations, and/or over another wireless communication interface through a wireless local area network (WLAN) router.

**[051]** The wireless terminal **10A** may be a mobile radiotelephone forming a part of a radiotelephone communication system **2** as illustrated in **Figure 1**. The system **2** includes the mobile wireless communication terminal **10A** and a base station transceiver, which is part of a wireless communications network **5**. In some embodiments of the present invention, the network **5** includes a base station transceiver that includes the radio transceiver(s) that define an individual cell in a cellular network and communicates with the mobile terminal **10A** (via an interface **7**) and other mobile terminals in the cell using a radio-link protocol. It will be understood that, in some embodiments of the present invention, many base station transceivers may be connected through, for example, a mobile switching center and other devices to define the wireless communications network **5**.

**[052]** The mobile terminal **10A** in the illustrated embodiments includes a portable housing assembly **12**, a display **20**, a user interface **22** (*i.e.*, a man machine interface (MMI)) including a speaker **24** (*i.e.*, a sound transducer), an audio player **26**, a controller **30**, a communication module **32**, a memory **34**, and a lighting device **50**. The foregoing components of the mobile terminal **10A** may be included in many conventional mobile terminals and their functionality is generally known to those skilled in the art. The mobile terminal **10A** further includes a song management module **40** and a light effects management module **44**, which may be stored in the memory **34**. The mobile terminal **10A** is capable of processing and playing song files (*e.g.*, MP3 files).

**[053]** The display **20** may be any suitable display screen assembly. For example, the display screen **28** may be a liquid crystal display (LCD) with or without auxiliary lighting (*e.g.*, a lighting panel).

**[054]** The user interface **22** may include any suitable input device(s) including, for example, a touch activated or touch sensitive device (*e.g.*, a touch screen), a joystick, a keyboard/keypad, a dial, a directional key or keys, and/or a pointing device (such as a mouse, trackball, touch pad, etc.). The speaker **24** generates sound responsive to an input audio signal. The user interface **22** can also include a microphone coupled to an audio processor that is configured to generate an audio data stream responsive to sound incident on the microphone.

**[055]** The controller **30** may support various functions of the mobile terminal **10A**. The controller **30** can be any commercially available or custom microprocessor, for example. In use, the controller **30** of the mobile terminal **10A** generates a display image on the display **20**. The controller **30** may control the audio player **26** and various other components of the mobile terminal **10A**.

**[056]** The memory **34** is configured to store digital information signals and data such as a digital audio signal and/or digital audio files.

**[057]** The communication module **32** is configured to communicate data over one or more wireless interfaces (*e.g.*, wireless interfaces **7**, **112**, **114**, **116**, **122**, and **134** as discussed herein (**Figures 1** and **3**)) to another remote wireless terminal as discussed herein. The communication module **32** can include a cellular communication module, a direct point-to-point connection module, and/or a WLAN module.

**[058]** With a cellular communication module, the wireless terminal **10A** can communicate via the base station(s) of the network **5** using one or more cellular

communication protocols such as, for example, Advanced Mobile Phone Service (AMPS), ANSI-136, Global Standard for Mobile (GSM) communication, General Packet Radio Service (GPRS), enhanced data rates for GSM evolution (EDGE), code division multiple access (CDMA), wideband-CDMA, CDMA2000, and Universal Mobile Telecommunications System (UMTS). The cellular base stations may be connected to a Mobile Telephone Switching Office (MTSO) wireless network, which, in turn, can be connected to a PSTN and/or another network.

**[059]** A direct point-to-point connection module may include a direct RF communication module or a direct IR communication module. The direct RF communication module may include a Bluetooth module. With a Bluetooth module, the wireless terminal **10A** can communicate via an ad-hoc network through a direct point-to-point interface.

**[060]** With a WLAN module, the wireless terminal **10A** can communicate through a WLAN (*e.g.*, a router **120** (**Figure 3**)) using a communication protocol that may include, but is not limited to, 802.11a, 802.11b, 802.11e, 802.11g, and/or 802.11i.

**[061]** The communication module **32** can include a transceiver typically having a transmitter circuit and a receiver circuit, which respectively transmit outgoing radio frequency signals (*e.g.*, to the network **5**, a router or directly to another terminal) and receive incoming radio frequency signals (*e.g.*, from the network **5**, a router or directly to another terminal), such as voice and data signals, via an antenna. The communication module **32** may include a short range transmitter and receiver, such as a Bluetooth transmitter and receiver. The antenna may be an embedded antenna, a retractable antenna or any antenna known to those having skill in the art without departing from the scope of the present invention. The radio frequency signals transmitted between the mobile terminal **10A** and the network **5**, router or other terminal may include both traffic and control signals (*e.g.*, paging signals/messages for incoming calls), which are used to establish and maintain communication with another party or destination. The radio frequency signals may also include packet data information, such as, for example, cellular digital packet data (CDPD) information. In addition, the transceiver may include an infrared (IR) transceiver configured to transmit/receive infrared signals to/from other electronic devices via an IR port.

**[062]** The mobile terminal **10A** may also be configured to electrically couple with another terminal via a wireline or cable for the transmission of digital communication

signals therebetween. The mobile terminal **10A** may include further components such as a camera device configured to generate a still image and/or video data stream based on incident light.

**[063]** According to some embodiments, the mobile terminal **10A** is a handheld mobile terminal. By "handheld mobile terminal," it is meant that the outer dimensions of the mobile terminal are adapted or configured and suitable for use by a typical operator using one hand. According to some embodiments, the total volume of the handheld mobile terminal **10A** is less than about 200 cc. According to some embodiments, the total volume of the handheld terminal **10A** is less than about 100 cc. According to some embodiments, the total volume of the handheld mobile terminal **10A** is between about 50 and 100 cc. According to some embodiments, no dimension of the handheld mobile terminal **10A** exceeds about 200 mm.

**[064]** A method for selecting and playing back a song file using mobile wireless communication terminals (*e.g.*, mobile terminals **10A-E**) according to embodiments of the present invention will now be described in reference to the flowchart of **Figure 2**. The method includes establishing a wireless connection between a host wireless communication terminal and at least one participant wireless communication terminal (**Block 280**). The host terminal maintains a list of nominated song files (**Block 282**). The host terminal receives at least one vote message from the at least one participant terminal (**Block 284**). The host terminal determines an elected song file from the list of nominated song files based on the at least one vote message (**Block 286**). The host terminal executes playback of the elected song file (**Block 288**). According to some embodiments, the host terminal also receives a song nomination from the at least one participant terminal and adds the song nomination to the list of nominated song files. The various method steps and operations as described herein for selecting and playing back nominated song files may be enabled and executed by the suitably configured controller **30** and song management module **40** of the implementing mobile terminal(s).

**[065]** According to some embodiments, connections are established between the host wireless communication terminal and a plurality of participant wireless communication terminals, and the host wireless communication terminal receives a plurality of vote messages from the plurality of participant wireless communication terminals and determines the elected song based on the plurality of vote messages.

**[066]** According to some embodiments, communication between the host wireless communication terminal and the participant wireless communication terminal is accomplished via a direct point-to-point interface, such as a Bluetooth wireless RF connection. According to some embodiments, communication between the host wireless communication terminal and the participant wireless communication terminal is accomplished via an indirect interface, such as through a WLAN or cellular-based system. Further aspects and embodiments of the present invention will be apparent from the following descriptions of further embodiments.

**[067]** With reference to **Figure 3**, an exemplary song file playback system **100A** according to embodiments of the present invention is shown therein. The system **100A** includes the mobile wireless communication terminal **10A** (also referred to herein as the "host wireless communication terminal" or "host terminal"), a plurality of additional participant wireless communication terminals **10B**, **10C**, **10D**, and **10E** (also referred to herein as the "participant wireless communication terminals" or "participant terminals"), and a media center **130**. The media center **130** includes apparatus adapted or configured to convert an audio signal (*e.g.*, a digital audio signal) to corresponding sound. The media center **130** may include, for example, a PC or laptop, a television, an audio receiver, stereo equipment, etc. The illustrated media center **130** includes a wireless communication module **132** and sound transducers (speakers) **136**. The wireless communication module **132** may be integrated with the media center **130** or may be an auxiliary or plug-in wireless communication module such as the Bluetooth Media Viewer MMV-100 module or Bluetooth Media Viewer MMV-200 module, each available from Sony Ericsson of Sweden. The terminals **10B-E** may be configured as described above with regard to the terminal **10A**. The terminals **10B-E** each include a wireless communication module **32** and a song management module **40**. However, the respective song management modules **40** may be differently configured for each terminal **10A-E** depending on the intended functionality of the device. According to some embodiments, all or some of the terminals **10B-E** are mobile wireless communication terminals. According to some embodiments, all or some of the terminals **10A-E** are handheld mobile wireless communication terminals.

**[068]** Referring now to **Figure 4**, a further exemplary system **100B** according to embodiments of the present invention is shown therein including the host terminal **10A** and the participant terminals **10B-E**. The system **100B** differs from the system **100A**

(**Figure 3**) in that the media center **130** is omitted and playback of the song files from the song play list **156** is conducted via the speaker **24** of the host terminal **10A**.

**[069]** Referring now to **Figure 5**, a further exemplary system **100C** according to embodiments of the present invention is shown therein including the host terminal **10A** and the participant terminals **10B-E**. The system **100C** differs from the system **100B** (**Figure 5**) in that playback of the song files from the song play list **156** is conducted via the speaker **24** of the host terminal **10A** and, additionally, through the respective speakers of the participant terminals **10B-E** and/or through one or more headsets (*e.g.*, in-ear stereo headsets) operatively connected to the terminals **10A-E**. More particularly, the controller **30** of the host terminal **10A** plays each song file thereon and also sends the song file to the participant terminals **10B-E** for simultaneous playback. According to some embodiments, the playback is synchronized between the mobile terminals **10A-E**.

**[070]** Various combinations and aspects of the exemplary systems **100A**, **100B**, **100C** may be employed and the host terminal **10A** may be configured to allow the user to selectively choose the device or combination of devices for playback from the various options discussed above. For example, the host terminal **10A** may be configured to execute playback via only the speaker **24** of the host terminal **10A**, via the speakers of the participant terminals **10B-E** but not the host terminal **10A**, via the speakers of the participant terminals **10B-E** and the media center **130**, etc. It will be appreciated that, when the song files are played back via the speakers of the terminals **10A-E**, the user of a given one of the participant terminals may disable the speaker thereof and/or may relay the song file for playback on another device (*e.g.*, an associated further media center or the like).

**[071]** Mobile terminals, methods and systems in accordance with embodiments of the present invention will now be described using an illustrative example of use. The host terminal **10A** is chosen to be the master or host terminal and the participant terminals **10B-E** are each designated as slave or participant terminals. The controller **30** of the host terminal **10A** establishes a wireless connection (*i.e.*, communicatively couples) with each of the participant terminals **10B-E**. According to some embodiments, the wireless connection is a direct wireless communication interface connection, according to some embodiments, a direct RF connection and, according to some embodiments, a Bluetooth connection. The connections may be established in known manner. For example, in the case of Bluetooth connections, the participant (slave) terminals **10B-E** may be set to a

searchable/discoverable state and the host (master) terminal **10A** emits an inquiry to identify the available participant (slave) terminals **10B-E** to form a piconet or personal area network.

**[072]** As illustrated, in the system **100A** (**Figure 3**) the host terminal **10A** communicates with the participant terminals **10B**, **10C** and **10D** via direct point-to-point wireless interfaces or links **112**, **114** and **116**, respectively, and with the participant terminal **10E** via wireless interfaces or links **118**, **122** through a WLAN router **120**. In the systems **100B (Figure 4)** and **100C** (**Figure 5**), the host terminal **10A** communicates with the participant terminals **10B-E** via direct point-to-point links **112**, **114**, **116**, **119**. In the case of the system **100A**, the host terminal **10A** is also communicatively coupled to the media center **130** to provide wireless song data signals via a wireless interface or link **134** to the communication module **132**. Alternatively, the host terminal **10A** can be connected to the media center **130** using a wireline or signal cable. It will be appreciated that, according to some embodiments, the interfaces may be various combinations of wireless interfaces that are direct (*e.g.*, Bluetooth) or indirect (*e.g.*, via a WLAN router or a cellular network **5**). According to some contemplated embodiments, all of the signals provided between the host terminal **10A** and the participant terminals **10B-E** to execute the song sharing procedure are provided via direct point-to-point wireless interfaces. According to some contemplated embodiments, all of the signals provided between the host terminal **10A** and the participant terminals to execute the song sharing procedure are provided via direct wireless radio frequency (RF) interfaces such as Bluetooth interfaces.

**[073]** Before or after establishing the connections, the host terminal **10A** may identify and designate valid participant terminals by any suitable method. According to some embodiments, the host terminal **10A** will poll or send an invitation to all or a selected group of potential participant terminals (*e.g.*, those within operational range of the host terminal's Bluetooth signal). The potential participant terminals may then opt in by replying with an acceptance of the invitation. Alternatively or additionally, the host terminal **10A** may accept unsolicited requests from participant terminals to participate. The host terminal **10A** may be used to define specific groups such as a listing of the potential participant terminals that will be permitted to participate (*e.g.*, to contribute song nominations and/or votes).

**[074]** Each song management module **40** provides a display **150** on the associated terminal **10A-E** as shown in **Figure 4**. The display provided on the host terminal **10A**

may differ from the display provided on the participant terminals **10B-E**. For example, the portions of the display **150** related to management functionality may be omitted from the participant terminal displays. Alternatively, the song management module **40** may provide no display on the participant terminals **10B-E**.

**[075]** Once the connections are established between the host terminal **10A** and the participant terminals **10B-E**, the host terminal **10A** may send a request to the participant terminals **10B-E** for song file nominations. For example, the host may actuate a "NOMINATIONS" button (**Figure 6**) on the display **150**. Each participant may use his or her respective participant terminal to send a nominee song identification to the host terminal **10A**. The nominee song identification designates a song file the participant wishes to add to the nominated song list. The nominee song identification may designate a song file stored on the participant's terminal **10B-E**. The song management module **40** of the sending participant terminal **10B-E** may provide a user interface to facilitate the selection and sending of the nominee song identification(s). For example, the module **40** may generate a list of the available stored songs and check boxes for selecting the song(s) to send to the host terminal **10A**. Additionally or alternatively, the nominated song list may comprise song identifications designating song files stored on the host terminal **10A**. According to some embodiments, only the host terminal **10A** may nominate song files. According to some embodiments, the host terminal **10A** and/or the participant terminals **10B-E** can nominate song files stored on mobile terminals other than themselves. The nominated song files constitute the nominated song list.

**[076]** The host terminal **10A** receives the nominee song identifications from the participant terminals **10B-E**. The song management module **40** of the host terminal **10A** creates and maintains a host nominated song list of these song identifications. The host nominated song list represents song files that are candidates to be played.

**[077]** According to some embodiments, the host terminal **10A** compiles the nominated song list and sends the nominated song list to the participant terminals **10B-E** for display thereon. According to some embodiments, each of the participant terminals **10B-E** receives nominations from other participant terminals (and, if applicable, the host terminal **10A**) and itself compiles and displays the nominated song list.

**[078]** In the illustrated embodiment, the display **150** includes a play list field **152** and control buttons **154** (*e.g.*, soft keys). The control buttons **154** will typically only be displayed on the host terminal display. The nominated song list **156** is displayed in the

play list field **152**. The nominated song list **156** includes a row-by-row series of song identifications **156A**, each corresponding to a respective song file. As illustrated, each song identification includes a song artist, a song name, and a song play time corresponding to the associated song file, as well as an identification of the participant that has submitted the song identification as a nominee. It will be appreciated that more, less and/or different information may be provided as well. A vote counter field **156B** may also be provided for each nominated song identification **156A**.

**[079]** The host may initiate an election by actuating an "ELECTION" button (**Figure 6**) on the display **150**, for example. The election may be initiated for a single selected song, for a slate of songs less the full nominated song list, or for a slate including all of the nominated songs. The participants can vote on the nominated song(s) using their mobile terminals **10B-E**. The votes are sent as vote messages by the participant terminals **10B-E** to the host terminal **10A**. The host may also be enabled to vote using his or her mobile terminal **10A**. The host terminal **10A** counts or tallies the vote messages and determines the "winning" or "elected" song file or files (*i.e.*, the nominated song file or files receiving the most votes).

**[080]** In some cases, only a single song file is elected for playback. In other cases, a plurality of nominated song files may be elected and placed in a play list in vote rank order for playback. According to some embodiments, the host terminal **10A** may originally configure a play list that is thereafter reordered by voting of the participant terminals **10B-E** (and, optionally, the host terminal **10A**).

**[081]** The host may selectively manage play of the songs represented by the song list **156** using the control buttons **154**, for example. For example, the "PLAY" and "STOP" buttons may be used to start and stop transmission of the song files to the media center **130** and/or the audio players of the mobile terminals **10A-E**. The "MOVE" button may be used to prioritize or change the order of the song identifications **156A** in the play list **156** (*i.e.*, to change the order in which the associated song files will be played). The "DELETE" button may be used to delete a song identification **156A** from the play list **156**. The "DETAILS" button may be used to delete a song identification **156A** from the play list **156** so that the associated song file will not be played. The "RANDOM MIX" button may be used to cause the host terminal **10A** to execute playback of the song files (*i.e.*, send the song files to the media center **130**) in a random or other non-sequential order.

Typically, the host terminal **10A** will execute playback of the song files in the listed sequence unless the random or other non-sequential mode is in effect.

**[082]** When the host terminal **10A** is in play mode, the controller **30** of the host terminal **10A** will identify the elected song identification **156A** that is to be played. The host terminal **10A** will then execute playback of the elected song file. The host terminal **10A** may execute playback by any suitable method.

**[083]** According to some embodiments, the host terminal **10A** will execute playback of the elected song by sending a song file request to the participant terminal **10B-E** that nominated the song identification to retrieve the song file corresponding to the song identification. The corresponding participant terminal will then send a copy of the identified song file (which is stored on the participant terminal) to the host terminal **10A**. According to some embodiments, the participant terminal sends the song file to the host terminal **10A** as a copy of the song file that is then temporarily stored on the host terminal **10A** (*e.g.*, in the memory **34**). According to other embodiments, the participant terminal sends the song file to the host terminal **10A** as a streaming song file. According to some embodiments, the request and song file signals between the host terminal and the participant terminal are sent wirelessly and, according to some embodiments, via a direct wireless RF connection such as Bluetooth.

**[084]** The controller **30** of the host terminal **10A** then executes playback of the retrieved song file by sending the song file to the media center **130** and/or the mobile terminals **10B-E**. The song file may be stored on the media center **130** and/or the mobile terminals **10B-E** for playback. Alternatively, the song file may be streamed to the media center **130** and/or the mobile terminals **10B-E**, for example, as the song file is streamed from the originating participant terminal to the host terminal **10A**. It may be preferable or necessary to stream the song file from the participant terminal to the host terminal and/or from the host terminal to the media center **130** and/or the mobile terminals **10B-E** if the allocated memory space on the host terminal **10A** is insufficient and/or storage of the song file on the host terminal **10A** is prevented or illegal. According to some embodiments, the song file, whether streamed or stored in whole, will be automatically erased (*i.e.*, without user intervention) from the host terminal **10A** during or after playback.

**[085]** Additionally or alternatively, the host terminal **10A** may execute playback of the song file by instructing the participant terminal on which the selected song file is

stored to play the selected song file and/or distribute the selected song file to other devices (*e.g.*, the other mobile terminals **10A-E** and/or the media center **130**) for playback.

**[086]** The controller **30** of the host terminal **10A** may execute the foregoing steps for each song identification **156A** in turn and automatically (*i.e.*, without user intervention). As the host terminal **10A** runs through the song list **156** in this fashion, the host may modify the play list **156** as desired. Also, according to some embodiments, the participant terminals **10B-E** can add new nominated song identifications to the song list **156** and vote on the nominated songs as the controller **30** of the host terminal **10A** runs through the play list **156**. According to some embodiments, new participant terminals can join the group and submit nominee song identifications and votes as the host terminal **10A** runs through the play list **156**.

**[087]** According to some embodiments, the host terminal may request nominations and/or only add to the nominated song list nominations of song files in a prescribed song file category or categories (*i.e.*, song files having associated therewith appropriate metadata tags as described herein). For example, the host terminal may request and limit the nominated song list to song files bearing a "disco" metadata tag.

**[088]** Various further modifications to the methods and apparatus may be made in accordance with embodiments of the present invention. According to some embodiments, some participant terminals can vote on nominated song files but cannot nominate song files. According to some embodiments, some participant terminals can nominate song files, but cannot vote on the nominated song files. According to some embodiments, some participant terminals can nominate and/or vote, but cannot play back the elected song files (*i.e.*, do not receive the song file from the host terminal or the originating participant terminal). According to some embodiments, some participant terminals can play back the elected song files, but cannot nominate or vote.

**[089]** Other functionality could also be provided. For example, the host terminal **10A** may allow the user to change the order of the song identifications **156A** according to one or more selected attributes (*e.g.*, contributing participant, song length, etc.). The host terminal **10A** may be configured to designate which of the participant terminals **10B-E** are permitted to add song identifications to the play list **156**. The participant terminals **10B-E** may be enabled to edit or modify the song list **156** in addition to adding song identifications. In this case, the host terminal **10A** may be configured to allow the host to select which of the participant terminals **10B-E** are and are not authorized to modify the

song play list **156** (*i.e.*, enable and disable the play list edit capability of the participant terminals).

**[090]** The mobile terminals, systems, and methods as described herein can provide a convenient and enjoyable mechanism for enabling a group of people to select and play back songs. The mobile terminals, systems, and methods can provide playback execution functionality and also allow the host terminal (and, in some cases, the participant terminals) to create, coordinate, control and/or manage a song play list. In practice, for example, partygoers can add songs from their own participant terminals to a nominated song list maintained on a host terminal (*e.g.*, the party host's own mobile terminal). If their song is elected, when their song's turn arrives in the playback sequence, a copy of the song file will automatically be sent to the host terminal and played. Thus, the partygoer need not take any further action. When, in accordance with some embodiments, the request and song transfer signals are communicated between the host terminal and the participant terminal via a direct wireless connection (*e.g.*, an RF interface such as a Bluetooth connection), the partygoer may simply place his or her participant terminal in a pocket or handbag. Participants may be added and removed as the procedure is executed. For example, when a participant leaves the Bluetooth range, his or her songs may be deleted from or moved down the play list.

**[091]** With reference to **Figure 7**, according to further embodiments of the present invention, mobile wireless communications terminals, methods, systems and computer program products are provided that enable selection and playback of files according to prescribed classifications or categories. Such mobile wireless communication terminals, methods, systems and computer program products may be employed with voting functionality and/or light effects functionality as described herein or independently thereof. The mobile terminal, etc., may be configured as otherwise discussed above with reference to the mobile terminals **10A-E** with suitable modifications to the song management module(s) **40** of the mobile terminals **10A-E** to enable the mobile terminals **10A-E** to function as described herein.

**[092]** A method for selecting and playing back a song file using mobile wireless communications terminals (*e.g.*, the mobile terminals **10A-E**) according to some embodiments of the present invention will now be described with reference to **Figure 7**. The method includes establishing a wireless connection between a host wireless communication terminal and at least one participant wireless communication terminal

(**Block 310**). The host terminal receives from the at least one participant terminal an identification of a song file that is stored on the at least one participant terminal and also has a metadata tag associated therewith that indicates the song file (with may be referred to a "compliant song file") is classified in a prescribed song file category (**Block 312**). The host terminal thereafter executes playback of the compliant song file (**Block 314**).

**[093]** The various method steps and operations as described herein for selecting and playing back compliant song files may be enabled and executed by the suitably configured controller **30** and song management module **40** of the implementing mobile terminal(s) **10A-E**.

**[094]** According to some embodiments, the host terminal establishes a wireless connection with a plurality of participant wireless communication terminals, requests identification of compliant songs from the plurality of participant terminals, and executes playback of one or more of the compliant songs on the plurality of participant terminals.

**[095]** According to some embodiments, the wireless connections is/are direct wireless communication interface connections, according to some embodiments, direct RF connections and, according to some embodiments, Bluetooth connections, as described herein. According to some embodiments, all of the signals provided between the host terminal and the participant terminal(s) to execute the compliant song identification procedure are provided via direct wireless RF interfaces such as Bluetooth interfaces. Similarly, according to some embodiments, the execution of playback of the compliant song files is accomplished by transferring the song files via direct wireless RF connections such as Bluetooth. More particularly, the communications between the terminals and song file transfers may be executed using the various apparatus methods and techniques described above with regard to the playlist management and playback function.

**[096]** According to more particular embodiments, a host terminal **10A** is designated and the controller **30** of the host terminal **10A** establishes wireless connections with one or more participant terminals such as the participant terminals **10B-E** as described above. At least some of the participant terminals **10B-E** have song files stored thereon. At least some of the participant song files include metadata tags assigned thereto. The metadata tag or tags correspond to some aspect of the associated song file by which the song file may be classified or categorized. Examples of aspects of song files and metadata tags are provided below.

**[097]** The host terminal **10A** selects or designates a song file category for playback. The designated category corresponds with a metadata tag or tags. The host terminal **10A** sends a message to the participant terminals **10B-E** requesting an identification of the song files on the participant terminals **10B-E** that have the designated metadata tag associated therewith (*i.e.*, the compliant song files).

**[098]** The participant terminals **10B-E** send response messages to the host terminal **10A** each including a respective listing of song files stored on the respective responding participant terminal having the prescribed metadata tag. According to some embodiments, the participant can modify the reply list to include only a compliant song file or files that the participant wishes to offer.

**[099]** The host terminal **10A** selects or is used by the host to select a compliant song file from the compliant song file identifications received from the participant terminals **10B-E**. The host terminal **10A** may select the song file manually or according to further criteria (*e.g.*, using the voting functionality described hereinbelow), for example. The selected song file may be added to a play list on the host terminal **10A** if one is maintained.

**[0100]** The host terminal **10A** then executes playback of the selected compliant song. The host terminal **10A** may execute playback by any suitable method as those disclosed herein above with regard to the voting function. According to some embodiments, the host terminal **10A** retrieves and plays the selected song file on its own speaker **24** and/or the host terminal **10A** retrieves and distributes the selected compliant song file for playback on one or more of the participant terminals **10B-E** and/or the media center **130**, for example. According to some embodiments, the host terminal **10A** distributes the compliant song file for simultaneous (and, optionally, synchronized) playback on a plurality of the participant terminals **10B-E**. Additionally or alternatively, the host terminal **10A** may instruct the participant terminal on which the selected song file is stored to play the selected song file and/or distribute the selected song file to another device (*e.g.*, the other mobile terminals and/or the media center) for playback.

**[0101]** The host terminal **10A** may request and/or accept song catalog listings from one or more participant terminals as discussed above. According to some embodiments, the song catalog listings include metadata tag data. The song file catalogs may include compliant and non-compliant song files. According to some embodiments, the host terminal controller **30** searches the received song catalogs to identify and list the compliant

song files. The host terminal **10A** may thereafter select a compliant song file for playback as described herein.

**[0102]** The metadata tag may take any suitable form and may be associated with the song files in any suitable manner. For example, the metadata tags can be embedded in, attached to or assigned to the song files by the originator of the song file (*e.g.*, a party or entity such as a music media vendor which constructed or configured the song file prior to distribution of the song file to the participant terminal). The metadata tag may be assigned to the song file by the participant (*e.g.*, using the participant terminal or otherwise).

**[0103]** As discussed above, the metadata tag indicates that the compliant song file is classified in a prescribed song file category. The prescribed song file category may be any suitable category. According to some embodiments, the metadata tag indicates that the song file includes a song of a particular genre (*e.g.*, rock, techno, country/western, alternative country, disco, R&B, Hip Hop, World, Religious, Punk, Classical, Acoustic, Folk, etc.). According to some embodiments, the metadata tag indicates that the song file includes a song of a particular type (*e.g.*, mood, meditation, light music, background music, etc.). According to some embodiments, the metadata tag indicates that the song file includes a song for a particular occasion or event (*e.g.*, dance party, dinner party, birthday, wedding, graduation, etc.). According to some embodiments, the metadata tag indicates that the song file includes a song by a specified musician or artist (*e.g.*, the compliant songs are all songs by The Beatles). According to some embodiments, the metadata tag indicates that the song file includes a song having a tempo in a particular range (*e.g.*, slow, medium, fast). According to some embodiments, the metadata tag indicates that the song file includes a song that has received or is assigned a particular certification or rating (*e.g.*, a "parental advisory" rating or, alternatively, a non-parental advisory rating). The metadata tag may indicate an operational or usage status of the song file. The operational or usage status may be determined by the actual use of the song file. By way of example and in accordance with some embodiments, the metadata tag may indicate that a song file has previously won votes (as discussed herein, for example), has been played at least a prescribed number of times previously, or has been played less than a prescribed number of times (*e.g.*, never been played back within a prescribed timeframe such as the current session). Thus, for example, a play list could be constructed of popular songs or songs that have never been played.

**[0104]** The search and selection criteria employed to identify and select compliant songs for playback may be suitably modified or augmented. Multiple search or request parameters can be set. For example, the host may request via the host terminal **10A** an identification of all song files having both a "dance party" metadata tag and also a "non-parental advisory" metadata tag. By way of further example, the host may request via the host terminal **10A** an identification of all song files having, in combination for each song file, a metadata tag indicating the song has not been played back in the current session, a "disco" metadata tag, and a metadata tag indicating the song file has received votes. The search or request parameters may indicate negative criteria, such as a request for all songs not having a "parental advisory rating" metadata tag.

**[0105]** With reference to **Figure 8** according to further embodiments of the present invention, mobile wireless communications terminals, methods, systems and computer program products are provided that provide light effects corresponding to playback of a song file. In particular, the mobile terminals, methods, systems and computer program products may provide distributed light effects. Such mobile wireless communication terminals, methods, systems, and computer program products may be employed with the play list, metadata tag, voting or other functionality as described herein or independently thereof. The mobile terminal, etc., may be configured as otherwise described above with respect to the mobile terminals **10A-E** with suitable modifications to enable the mobile terminals **10A-E** to function as described herein.

**[0106]** A method for providing light effects on at least one participant wireless communication terminal and in correspondence with playback of a song file according to some embodiments of the present invention will now be described with reference to **Figure 8**. The method includes establishing a wireless connection between a host wireless communication terminal and at least one participant wireless communication terminal (**Block 410**). The host wireless communication terminal sends at least one light effect signal to the at least one participant wireless communication terminal instructing the at least one participant wireless communication terminal to control at least one lighting device of the at least on participant wireless communication terminal in correspondence with playback of a song file (**Block 412**). The various method steps and operations as described herein for providing light effects may be enabled and executed by the suitably configured controller **30** and the light effects management module **44** (**Figure 1**) of the implementing mobile terminals.

**[0107]** According to some embodiments, the host terminal establishes a wireless connection with a plurality of participant wireless communication terminals, and sends light effect signals to each of the plurality of participant terminals.

**[0108]** According to some embodiments, the wireless connection is/are direct wireless communication interface connections, according to some embodiments, direct RF connections and, according to some embodiments, Bluetooth connections, as described herein. According to some embodiments, all of the signals provided between the host terminal and the participant terminal(s) to execute the light effects thereon are provided via direct wireless RF interfaces such as Bluetooth interfaces. Similarly, according to some embodiments, the execution of playback of the song files is accomplished by transferring the song files via direct wireless RF connections such as Bluetooth. More particularly, the communications between the terminals and song file transfers may be executed using the various apparatus methods and techniques described above with regard to the playlist management and playback function.

**[0109]** According to more particular embodiments and with reference to **Figure 9**, there may be provided a system **400** including a host wireless communication terminal such as the mobile terminal **10A** and one or more participant wireless communications terminals such as the mobile terminals **10B-E** each having a respective lighting device or devices **50**. According to some embodiments, multiple participant wireless communication terminals **10B-E** are employed each having lighting devices **50**. The host wireless communication terminal **10A** may likewise include a lighting device **50**. With reference to **Figure 1**, each such lighting device **50** includes light source **52** and a light control **54** and is configured to selectively provide two different, mutually distinguishable light states. The light source **52** may include a suitable light source such as a light emitting diode (LED), a liquid crystal display (LCD), an incandescent lamp, or a phosphorescent material. For example, according to some embodiments, the light sources **52** include keypad LEDs and/or LCD displays of the mobile terminals **10A-E**. The light control **54** is adapted to selectively control the lighting device **50**. The light control **54** may itself be controlled by the controller **30** or the like of the associated terminal. The light control **54** may be an electrical switch or circuit capable of selectively actuating and deactuating the light source **52**, or a moveable element such as a shutter or a lens. The at least two light states may include different light intensities (including on/off or varying (continuous or step wise) degrees of intensity) and/or different colors.

**[0110]** In use during playback of a song file from or via the host terminal **10A**, the host terminal **10A** sends light effect orders or signals **422**, **424**, **426**, and **428** to each of the participant terminals **10B-E**, respectively. The light effect signals embody or represent light control orders or instructions from the host terminal **10A**. The light effect signals are dependent on, based on or correspond with the playback of the song file.

**[0111]** The participant terminals **10B-E** receive the light effect signals **422**, **424**, **426**, and **428** and the respective light controls **54** of the participant terminals **10B-E** operate the associated light sources **52** in accordance therewith. Accordingly, the host terminal **10A** governs the light effects displayed on the participant terminals **10B-E**. For example, the light effect signals **422**, **424**, **426**, and **428** from the host terminal **10A** may cause the light sources **52** to turn on and off. According to some embodiments, the participant terminals **10B-E** receiving the light effect signals **422**, **424**, **426**, and **428** and displaying the light effects also simultaneously playback the audio of the song file. According to some embodiments, the accompanying audio signals trigger the light effects so that the light effects are synchronized and dependent on the audio signals.

**[0112]** The host terminal may dynamically control the light effects on a given participant terminal or may order or instruct the participant terminal to enter an appropriate mode after which the participant terminal's own controller **30** executes a corresponding light effects program. For example, the host terminal may send a series of light effect signals that directly order or cause the participant terminal to blink a light source **52** on and off. Alternatively, the host terminal may instruct the participant terminal to enter a mode wherein the participant terminal's light effect management module **44** causes its light source **52** to blink or the like in synchrony with the audio signal.

**[0113]** The light effects may be any suitable light actuation, modulation, display, etc. According to some embodiments, the light effects include blinking or pulsing of one more light sources **52** and, according to some embodiments, blinking or pulsing of one or more LEDs. According to some embodiments, the light effects include video or animation. In particular, the light effects may include video or animation displayed on the participant terminal's display **20** (*e.g.*, an LCD). The video or animation may be generated from a video file pre-stored on the participant mobile terminal or a video file transmitted (*e.g.*, streamed) from the host terminal **10A**.

**[0114]** The host terminal **10A** may also govern the distribution of light effects across the participant terminals **10B-E**. According to some embodiments, the host

terminal **10A** sends different light effect signals to different participant terminals. Thus, over the course of playback of a given song file the light source **52** of the participant terminal **10B** may turn on and off at different times than the light source **52** of the participant terminal **10C**, for example. The host terminal **10A** may thereby cause the participant terminals **10B-E** to simultaneously display synchronized light effects in dynamic patterns that differ from one another. For example, the distributed light effects on the multiple mobile terminals may provide a disco light effect.

**[0115]** According to some embodiments, the host terminal sends light effect signals to one or more participant terminals that cause their lighting devices to actuate (*e.g.*, pulse on and off) in response to audio frequencies of the song file in a first range (*e.g.*, a high frequency range) and sends light effect signals to one or more other participant terminals that cause their lighting devices **50** to actuate (*e.g.*, pulse on and off) in response to audio frequencies of the song file in a second range (*e.g.*, low audio frequency range) different from the first range.

**[0116]** According to some embodiments, the host terminal causes the participant terminals to playback the song file in multi-channel audio with different audio channels being played on different participant terminals. For example, a first set of participant terminals (*e.g.*, the participant terminals **10B** and **10C**) receive from the host terminal **10A** and play back a first audio channel (*e.g.*, a left stereo channel) of the song file, and a second set of the participant terminals (*e.g.*, the participant terminals **10D** and **10E**) receive from the host terminal **10A** and play back a second, different audio channel (*e.g.*, a right stereo channel) of the song file. According to some embodiments, the light effect signals sent to the first set of participant terminals are paired with or correspond to the first audio channel and the light effect signals sent to the second set of participant terminals are paired with or correspond to the second audio channel. For example, the lighting devices **50** of the first set of participant terminals may blink in tempo or cadence with the first audio channel while the lighting devices **50** of the second set of participant terminals may blink in tempo or cadence with the second audio channel.

**[0117]** According to further embodiments, the multi-channel audio song file includes more than two audio channels and more than two separate channels are simultaneously respectively played back on different participant terminals. For example, the song file may be played back in a surround sound mode with three or more participant

terminals playing different channels and displaying different corresponding light effects from one another.

**[0118]** According to some embodiments, the relative positions or locations of the host terminal and/or the participant terminals are determined and the host terminal assigns the light effects to the participant terminals in accordance with their relative locations. Any suitable techniques can be used to distribute audio channels and determine the relative spatial locations of the terminals. According to some embodiments, the multi-channel audio playback distribution is accomplished as described in Applicant's European Patent Application No. 04103212.9, filed July 7, 2004, published as EP 1615464A1 on January 11, 2006, the disclosure of which is incorporated herein by reference. Moreover, the relative positions of the host terminal and the participant terminals may be determined and utilized as described in European Patent Application No. 0403312.9. Additionally, calibration may be accomplished as described in European Patent Application No. 04033129 or using any other suitable techniques to compensate for radio link delays.

**[0119]** According to some embodiments, the light effects coordinated or governed by the host terminal **10A** include a dynamic pattern that travels from mobile terminal to mobile terminal. For example, a light source (*e.g.*, an LED or an LCD display) may be pulsed on each mobile terminal **10A-E** in series so that the light pulse appears to travel along (*e.g.*, up and down) a row of the mobile terminals **10A-E**. To facilitate such operations, the relative spatial locations of the mobile terminals **10A-E** may be determined as discussed above and the light effects assigned to the several mobile terminals **10A-E** in accordance with their determined positions.

**[0120]** According to further embodiments, the dynamic patterned light effects include video or animation displayed on multiple mobile terminals **10A-E** such that it appears to travel from display screen **20** (*e.g.*, LCD) to display screen **20** of the mobile terminals **10A-E**. For example, in **Figure 10A**, three participant terminals **10B-D** are shown having respective display screens **20** at a first point in time to provide a collective or combined image **448A**. The displays **20** are controlled such that, at a later time, the respective images **442A**, **444A**, **446A** are replaced with new images **442B**, **444B**, **446B** as shown in **Figure 10B** to provide a new combined image **448B**, and, at a still later time, the images **442B**, **44B**, **446B** are replaced with new images **442C**, **444C**, **446C** to provide a new combined image **448C** (**Figure 10C**) giving the appearance that the objects in the combined images **448A**, **448B**, **448C** have traveled over time along the displays **20**

between the mobile terminals **10B-D**. Thus, in the embodiment of **Figures 10A-C**, the light effects are distributed across the several mobile terminals **10B-D** in a dynamic pattern that gives the impression of an animated person walking from display screen **20** to display screen **20** of the mobile terminals **10B-D**. This operation may be paired with and facilitated by determining the relative spatial positions of the mobile terminals as discussed above.

**[0121]** The light effects as controlled by the host terminal may also include use of the screens or displays of multiple mobile terminals without screen-to-screen traveling animation. For example, the screens **20** may be used as a collective screen to display a still image.

**[0122]** Various of the invention embodiments disclosed herein can be used with or independently of other invention embodiments as disclosed herein. For example, a song file or song files may be selected for playback using the metadata tag procedure or voting procedure described herein, with the song files being played back one at a time without creation of a song file play list. According to some embodiments, the host terminal may only coordinate selection of song files for playback and instruct selected participant terminals to send song files (*e.g.*, via streaming or as a complete file) to one or more playback device(s) (*e.g.*, other participant terminals, the host terminal, or the media player) or to play the song file on the originating participant terminal only. According to some embodiments, the "host" status may shift among the mobile terminals **10A-E**.

**[0123]** The application programs described herein, including the song management module **40** and the light effects management module **44**, are illustrative of programs that implement various features according to embodiments of the present invention. It will be appreciated that other and/or additional application programs may be employed in accordance with embodiments of the present invention.

**[0124]** Although **Figure 1** illustrates an exemplary hardware/software architecture that may be used in mobile terminals and/or other electronic devices for management and playback of song files, it will be understood that the present invention is not limited to such a configuration but is intended to encompass any configuration capable of carrying out operations described herein. For example, although the memory **34** is illustrated as separate from the controller **30**, the memory **34** or portions thereof may be considered as a part of the controller **30**. More generally, while particular functionalities are shown in particular blocks by way of illustration, functionalities of different blocks and/or portions

thereof may be combined, divided, and/or eliminated. Moreover, the functionality of the hardware/software architecture of **Figure 1** may be implemented as a single processor system or a multi-processor system in accordance with various embodiments of the present invention.

**[0125]** Many alterations and modifications may be made by those having ordinary skill in the art, given the benefit of present disclosure, without departing from the spirit and scope of the invention. Therefore, it must be understood that the illustrated embodiments have been set forth only for the purposes of example, and that it should not be taken as limiting the invention as defined by the following claims. The following claims, therefore, are to be read to include not only the combination of elements which are literally set forth but all equivalent elements for performing substantially the same function in substantially the same way to obtain substantially the same result. The claims are thus to be understood to include what is specifically illustrated and described above, what is conceptually equivalent, and also what incorporates the essential idea of the invention.

CLAIMS

1. A mobile wireless communication terminal comprising:

a wireless communication module that is configured to communicate with other communication terminals over a wireless interface; and

a controller that is configured to establish a connection with at least one participant wireless communication terminal via the wireless communication module, to receive from the at least one participant wireless communication terminal an identification of a compliant song file stored on the at least one participant wireless communication terminal and having a metadata tag associated therewith indicating that the compliant song file is classified in a prescribed song file category, and to execute playback of the compliant song file.

2. The wireless communication terminal according to claim 1, wherein the controller is configured to establish a connection with a plurality of participant wireless communication terminals via the wireless communication module, and to receive identifications of compliant songs from at least two of the plurality of participant wireless communication terminals.

3. The wireless communication terminal according to any of the claims 1-2, wherein the controller is configured to establish a connection with a plurality of participant wireless communication terminals via the wireless communication module, and to execute playback of the compliant song file simultaneously on the plurality of participant wireless communication terminals.

4. The wireless communication terminal according to any of the claims 1-3, wherein the controller is configured to retrieve the compliant song file from the at least one participant wireless communication terminal for playback.

5. The wireless communication terminal according to any of the claims 1-4, wherein:

the wireless communication module is configured to communicate with other communication terminals over a direct point-to-point wireless interface; and

the controller is configured to establish the connection with the at least one participant wireless communication terminal via the wireless communication module via the direct point-to-point wireless interface, and to receive the identification of a compliant song file from the at least one participant wireless communication terminal via the direct point-to-point wireless interface.

6. The wireless communication terminal according to any of the claims 1-5, wherein the wireless communication module comprises a Bluetooth transmitter.

7. The wireless communication terminal according to any of the claims 1-6, wherein the wireless communication terminal includes a cellular telephone.

8. A mobile wireless communication terminal comprising:

a wireless communication module that is configured to communicate with other communication terminals over a wireless interface; and

a controller that is configured to establish a connection with at least one participant wireless communication terminal via the wireless communication module, to maintain a list of nominated song files, to receive at least one vote message from the at least one participant wireless communication terminal, to determine an elected song file from the list of nominated song files based on the at least one vote message, and to execute playback of the elected song file.

9. The wireless communication terminal according claim 8, wherein the controller is configured to receive an identification of a nominated song file from the at least one participant wireless communication terminal, and to add the identification of the nominated song file to the list of nominated song files.

10. The wireless communication terminal according to any of the claims 8-9, wherein the controller is configured to establish a connection with a plurality of participant wireless communication terminals via the wireless communication module, and to receive vote messages from at least two of the plurality of participant wireless communication terminals.

11. The wireless communication terminal according to any of the claims 8-10, wherein the controller is configured to establish a connection with a plurality of participant wireless communication terminals via the wireless communication module, and to execute playback of the elected song file simultaneously on the plurality of participant wireless communication terminals.

12. The wireless communication terminal according to any of the claims 8-11, wherein the controller is configured to retrieve the elected song file from the at least one participant wireless communication terminal for playback.

13. The wireless communication terminal according to any of the claims 8-12, wherein:

the wireless communication module is configured to communicate with other communication terminals over a direct point-to-point wireless interface; and

the controller is configured to establish the connection with the at least one participant wireless communication terminal via the wireless communication module via the direct point-to-point wireless interface, and to receive the at least one vote message from the at least one participant wireless communication terminal via the direct point-to-point wireless interface.

14. The wireless communication terminal according to any of the claims 8-13, wherein the wireless communication module comprises a Bluetooth transmitter.

15. The wireless communication terminal according to any of the claims 8-14, wherein the wireless communication terminal includes a cellular telephone.

16. A mobile wireless communication terminal comprising:

a wireless communication module that is configured to communicate with other communication terminals over a wireless interface; and

a controller that is configured to establish a connection with at least one participant wireless communication terminal via the wireless communication module, and to send at least one light effect signal to the at least one participant wireless communication terminal instructing the at least one participant wireless communication terminal to control at least

one lighting device of the at least one participant wireless communication terminal in correspondence with playback of a song file.

17. The wireless communication terminal according claim 16, wherein the controller is configured to establish a connection with a plurality of participant wireless communication terminals via the wireless communication module, and to send light effect signals to each of the plurality of participant wireless communication terminals instructing each of the plurality of participant wireless communication terminals to control a lighting device thereof in correspondence with playback of the song file.

18. The wireless communication terminal according to claim 17, wherein the controller is configured to send light effect signals to each of the plurality of participant wireless communication terminals instructing the plurality of participant wireless communication terminals to control the lighting devices thereof differently from one another.

19. The wireless communication terminal according to claim 18, wherein the controller is configured to send light effect signals to each of the plurality of participant wireless communication terminals so as to cause the plurality of participant wireless communication terminals to display on respective displays thereof an image that moves over time from the display of a first of the plurality of participant wireless communication terminals to the display of a second of the plurality of participant wireless communication terminals.

20. The wireless communication terminal according to any of the claims 18-19, wherein the controller is configured to send light effect signals to each of the plurality of participant wireless communication terminals so as to cause a lighting device of a first of the plurality of participant wireless communication terminals to respond to audio signals in a first audio frequency range and to cause a lighting device of a second of the plurality of participant wireless communication terminals to respond to audio signals in a second audio frequency range different from the first audio frequency range.

21. The wireless communication terminal according to any of the claims 17-20, wherein the controller is configured to execute playback of the song file simultaneously on the plurality of participant wireless communication terminals.

22. The wireless communication terminal according to any of the claims 16-21, wherein:

the wireless communication module is configured to communicate with other communication terminals over a direct point-to-point wireless interface; and

the controller is configured to establish the connection with the at least one participant wireless communication terminal via the wireless communication module via the direct point-to-point wireless interface, and to send the at least one light effect signal to the at least one participant wireless communication terminal via the direct point-to-point wireless interface.

23. The wireless communication terminal according to any of the claims 16-22, wherein the wireless communication module comprises a Bluetooth transmitter.

24. The wireless communication terminal according to any of the claims 16-23, wherein the wireless communication terminal includes a cellular telephone.

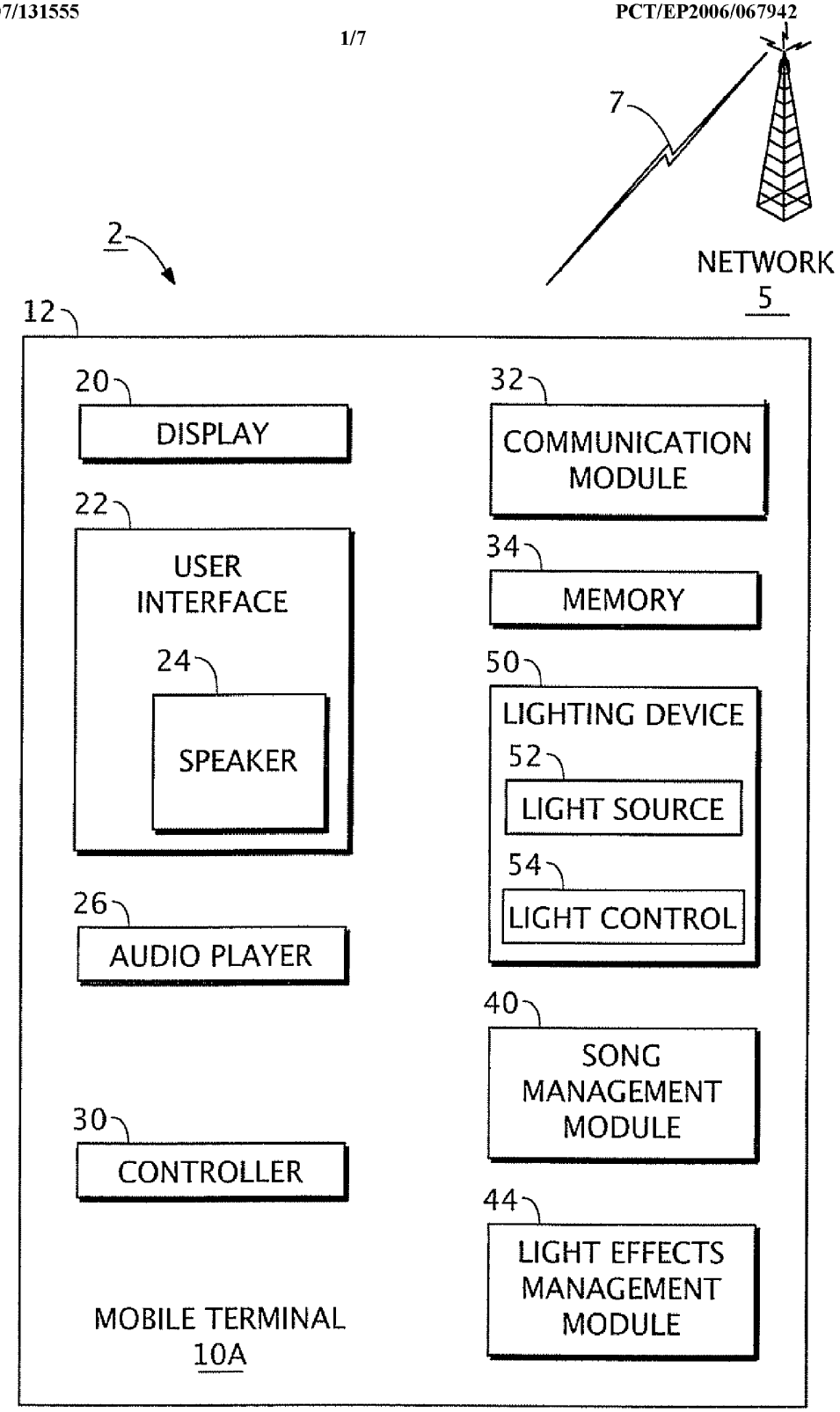

7
NETWORK
5
2
12
20
DISPLAY
22
USER INTERFACE
24
SPEAKER
26
AUDIO PLAYER
30
CONTROLLER
MOBILE TERMINAL
10A
32
COMMUNICATION MODULE
34
MEMORY
50
LIGHTING DEVICE
52
LIGHT SOURCE
54
LIGHT CONTROL
40
SONG MANAGEMENT MODULE
44
LIGHT EFFECTS MANAGEMENT MODULE

FIG. 1

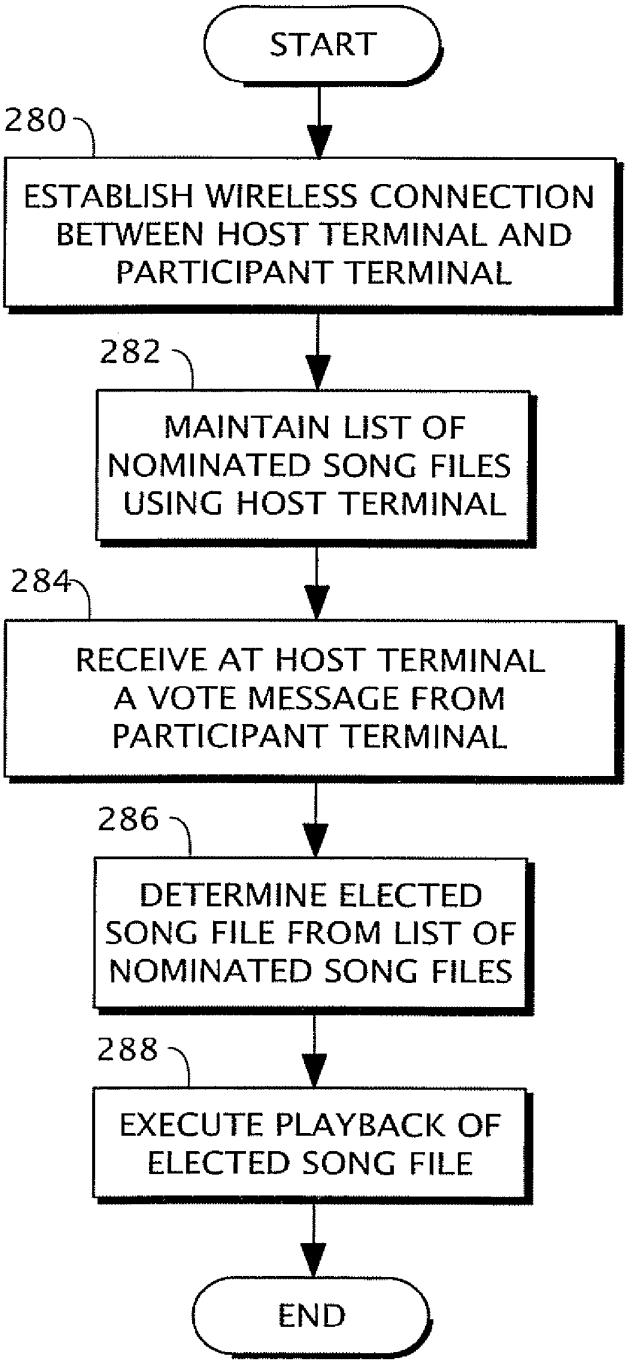

START
280
ESTABLISH WIRELESS CONNECTION BETWEEN HOST TERMINAL AND PARTICIPANT TERMINAL
282
MAINTAIN LIST OF NOMINATED SONG FILES USING HOST TERMINAL
284
RECEIVE AT HOST TERMINAL A VOTE MESSAGE FROM PARTICIPANT TERMINAL
286
DETERMINE ELECTED SONG FILE FROM LIST OF NOMINATED SONG FILES
288
EXECUTE PLAYBACK OF ELECTED SONG FILE
END

FIG. 2

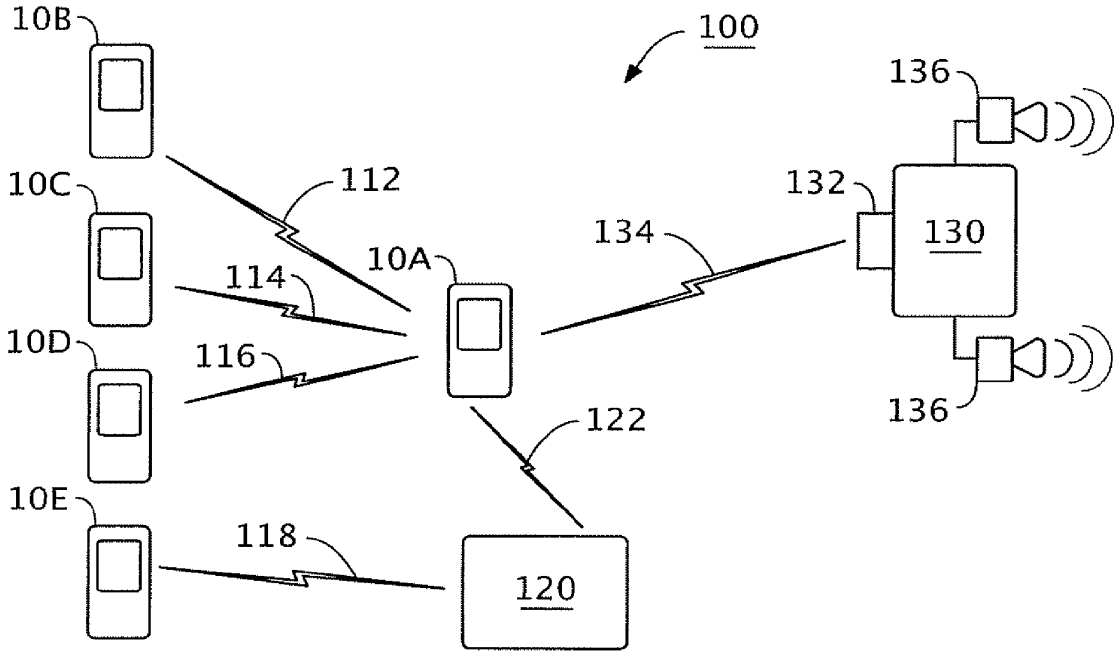

10B
100
136
10C
112
132
134
130
10A
114
10D
116
122
136
10E
118
120

FIG. 3

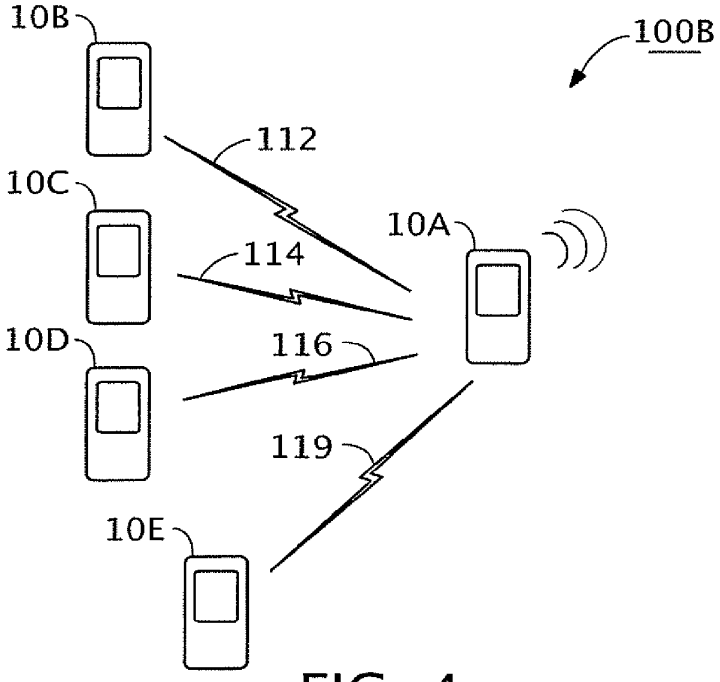

10B
100B
112
10C
10A
114
10D
116
119
10E

FIG. 4

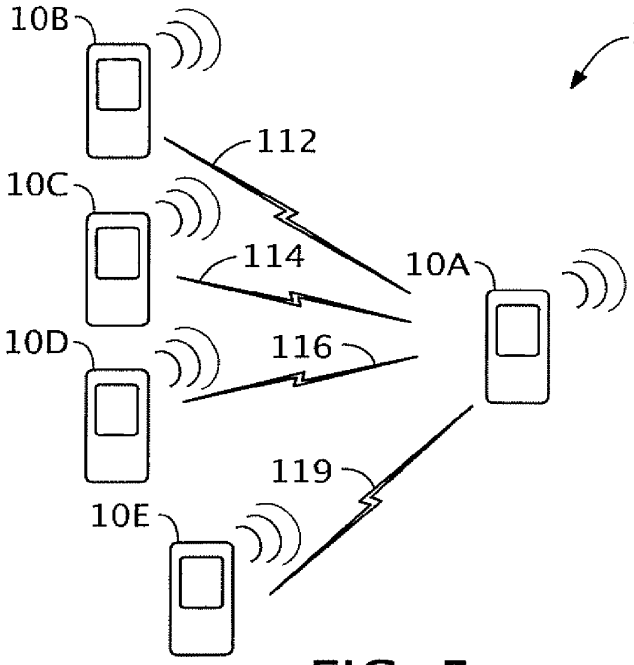

10B
100C
112
10C
114
10A
10D
116
119
10E

FIG. 5

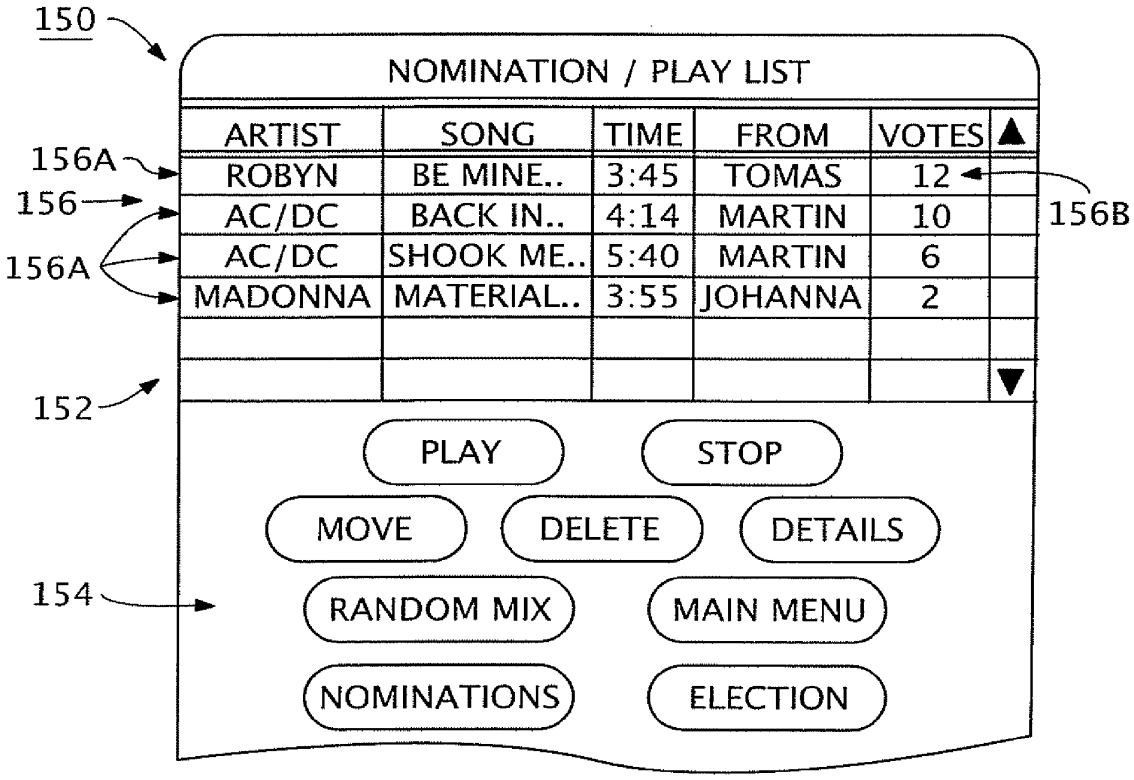

150
NOMINATION / PLAY LIST
ARTIST
SONG
TIME
FROM
VOTES
156A
ROBYN
BE MINE..
3:45
TOMAS
12
156
AC/DC
BACK IN..
4:14
MARTIN
10
156B
156A
AC/DC
SHOOK ME..
5:40
MARTIN
6
MADONNA
MATERIAL..
3:55
JOHANNA
2
152
PLAY
STOP
MOVE
DELETE
DETAILS
154
RANDOM MIX
MAIN MENU
NOMINATIONS
ELECTION

FIG. 6

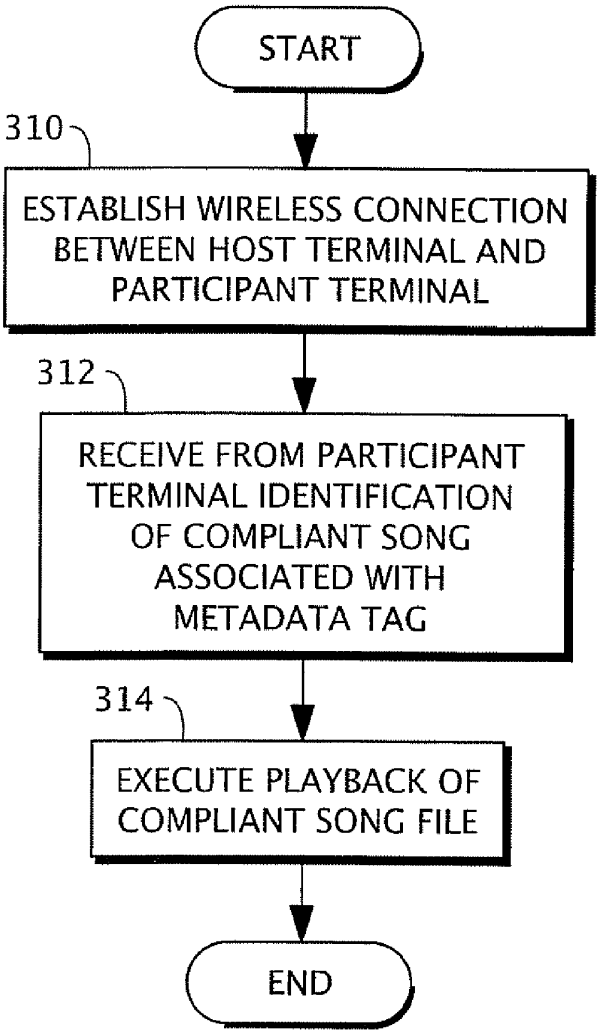

START
310
ESTABLISH WIRELESS CONNECTION BETWEEN HOST TERMINAL AND PARTICIPANT TERMINAL
312
RECEIVE FROM PARTICIPANT TERMINAL IDENTIFICATION OF COMPLIANT SONG ASSOCIATED WITH METADATA TAG
314
EXECUTE PLAYBACK OF COMPLIANT SONG FILE
END

FIG. 7

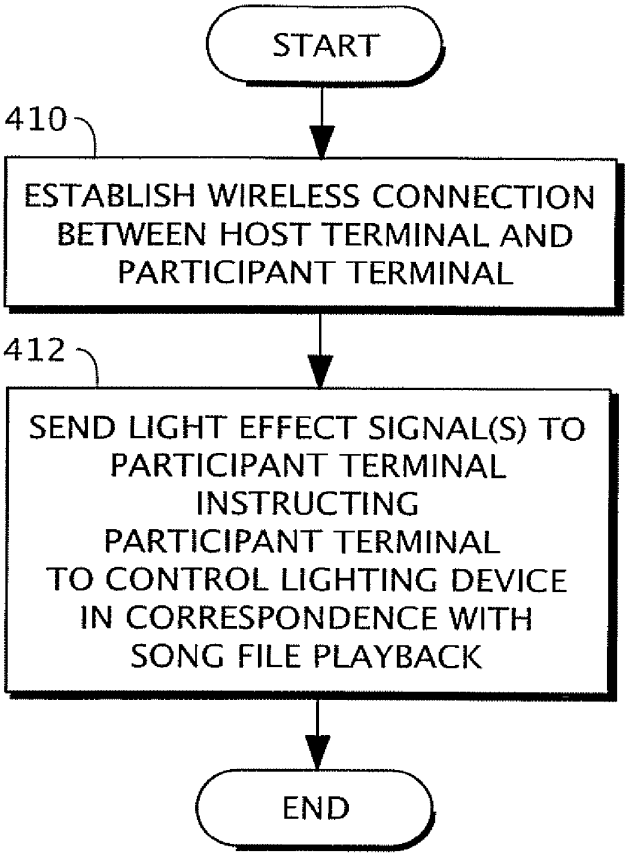

START
410
ESTABLISH WIRELESS CONNECTION BETWEEN HOST TERMINAL AND PARTICIPANT TERMINAL
412
SEND LIGHT EFFECT SIGNAL(S) TO PARTICIPANT TERMINAL INSTRUCTING PARTICIPANT TERMINAL TO CONTROL LIGHTING DEVICE IN CORRESPONDENCE WITH SONG FILE PLAYBACK
END

FIG. 8

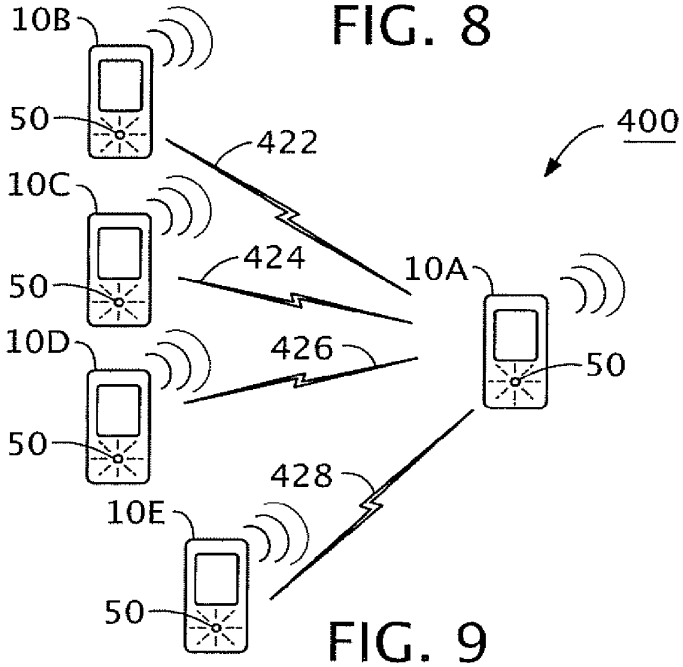

10B
50
422
400
10C
50
424
10A
10D
426
50
50
428
10E
50

FIG. 9

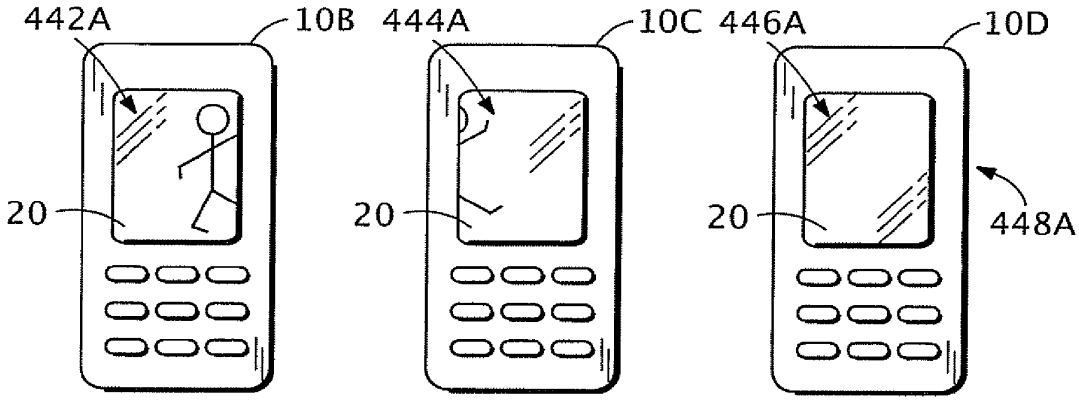



FIG. 10A

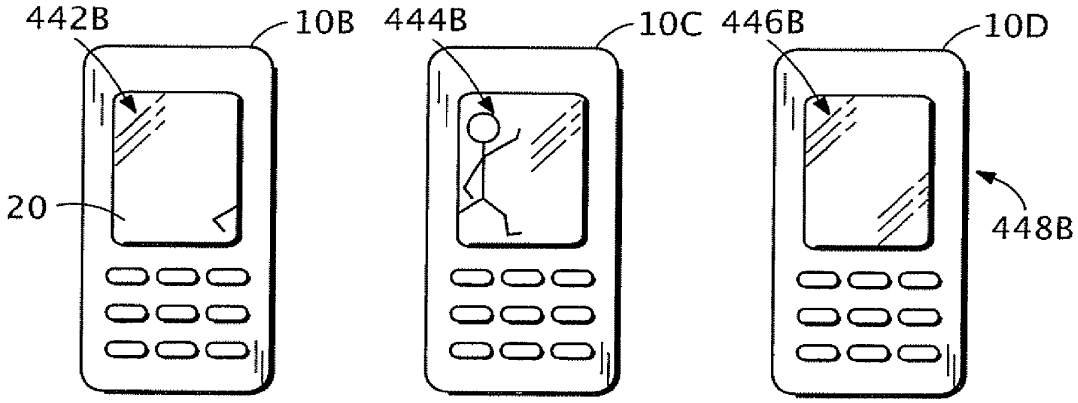



FIG. 10B

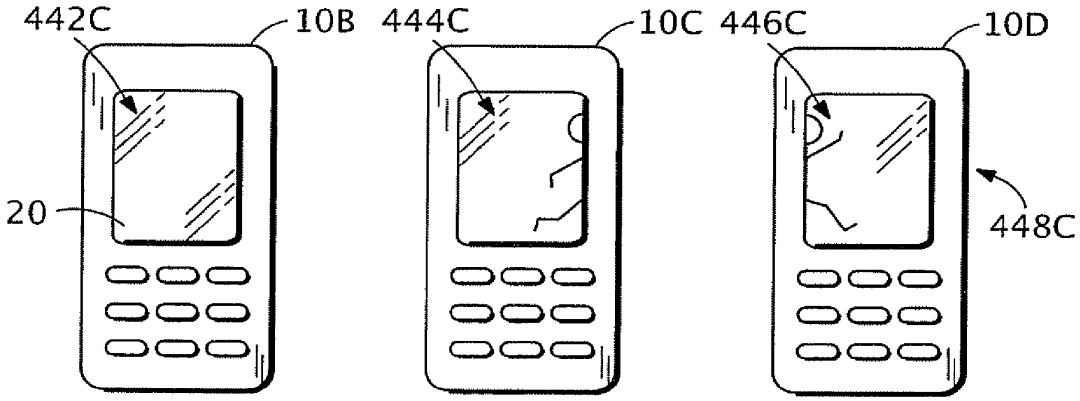



FIG. 10C

# INTERNATIONAL SEARCH REPORT

International application No
PCT/EP2006/067942

A. CLASSIFICATION OF SUBJECT MATTER
INV. H04L29/06 H04L12/28

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)
H04L

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

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)
EPO-Internal, WPI Data, INSPEC

C. DOCUMENTS CONSIDERED TO BE RELEVANT

| Category* | Citation of document, with indication, where appropriate, of the relevant passages | Relevant to claim No. |
|---|---|---|
| X | WO 2004/075169 A2 (KONINKL PHILIPS ELECTRONICS NV [NL]; PHILIPS CORP [US]; VAN DE SLUIS B)<br>2 September 2004 (2004-09-02)<br>abstract<br>page 1, line 14 - line 30 | 1,2,4-7 |
| Y | page 11, line 21 - line 27<br>page 16, line 13 - line 26<br>page 21, line 8 - page 22, line 11 | 3 |
| Y | US 2002/168938 A1 (CHANG CHIN-CHI [TW])<br>14 November 2002 (2002-11-14)<br>abstract<br>page 1, paragraphs 9,10<br>page 2, paragraph 24 | 3,11 |

-/--

[X] Further documents are listed in the continuation of Box C.

[X] See patent family annex.

* Special categories of cited documents :

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier document but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

"&" document member of the same patent family

| Date of the actual completion of the international search | Date of mailing of the international search report |
|---|---|
| 20 April 2007 | 26/04/2007 |

| Name and mailing address of the ISA/ | Authorized officer |
|---|---|
| European Patent Office, P.B. 5818 Patentlaan 2<br>NL – 2280 HV Rijswijk<br>Tel. (+31–70) 340–2040, Tx. 31 651 epo nl,<br>Fax: (+31–70) 340–3016 | BLANCO CARDONA, P |

Form PCT/ISA/210 (second sheet) (April 2005)

# INTERNATIONAL SEARCH REPORT

International application No
PCT/EP2006/067942

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

| Category* | Citation of document, with indication, where appropriate, of the relevant passages | Relevant to claim No. |
|---|---|---|
| X | US 2003/032419 A1 (SHIBASAKI HIROAKI [JP] ET AL) 13 February 2003 (2003-02-13)<br>abstract<br>page 9, paragraphs 138,139<br>page 10, paragraphs 145,149<br>page 11, paragraphs 158,159 | 1 |
| X<br>Y | US 2003/037157 A1 (PESTONI FLORIAN [US] ET AL) 20 February 2003 (2003-02-20)<br>abstract<br>page 1, paragraphs 3,4,11<br>page 2, paragraphs 21,35,36<br>page 4, paragraphs 51,59<br>page 5, paragraphs 67,68<br>page 6, paragraphs 78,80,85,87 | 8-10,<br>12-15<br><br>11 |
| X<br>A | US 2005/160270 A1 (GOLDBERG DAVID [US] ET AL) 21 July 2005 (2005-07-21)<br>abstract<br>page 2, paragraph 18<br>page 3, paragraph 33<br>page 12, paragraph 172<br>page 29, paragraph 330-333<br>page 30, paragraph 340<br>page 34, paragraphs 377,378 | 16-18,<br>20-24<br><br>19 |

Form PCT/ISA/210 (continuation of second sheet) (April 2005)

# INTERNATIONAL SEARCH REPORT

International application No.
PCT/EP2006/067942

**Box II Observations where certain claims were found unsearchable (Continuation of item 2 of first sheet)**

This International Search 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.:
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

**Box III Observations where unity of invention is lacking (Continuation of item 3 of first sheet)**

This International Searching Authority found multiple inventions in this international application, as follows:

see additional sheet

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.

FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

This International Searching Authority found multiple (groups of) inventions in this international application, as follows:

1. claims: 1-7

   Mobile terminal executing playback of a song file simultaneously on a plurality of wireless terminals

   ---

2. claims: 8-15

   Mobile terminal receiving vote messages for nominated song files

   ---

3. claims: 16-24

   Mobile terminal sending a signal to other wireless terminals instructing to control a lighting device in correspondence with the playback of a song file

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## INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No
PCT/EP2006/067942

| Patent document cited in search report | Publication date | Patent family member(s) | Publication date |
|---|---|---|---|
| WO 2004075169 A2 | 02-09-2004 | EP 1597895 A2 | 23-11-2005 |
| | | JP 2006518507 T | 10-08-2006 |
| | | KR 20050104382 A | 02-11-2005 |
| US 2002168938 A1 | 14-11-2002 | US 2004248601 A1 | 09-12-2004 |
| US 2003032419 A1 | 13-02-2003 | EP 1303077 A2 | 16-04-2003 |
| | | JP 2003050589 A | 21-02-2003 |
| US 2003037157 A1 | 20-02-2003 | NONE | |
| US 2005160270 A1 | 21-07-2005 | NONE | |

Form PCT/ISA/210 (patent family annex) (April 2005)

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

(19) World Intellectual Property Organization
International Bureau

(43) International Publication Date
3 January 2014 (03.01.2014)

WIPO | PCT

(10) International Publication Number
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(21) International Application Number:
PCT/US2013/046386

(22) International Filing Date:
18 June 2013 (18.06.2013)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
13/533,105 26 June 2012 (26.06.2012) US

(71) Applicant: **SONOS, INC.** [US/US]; 223 East De La Guerra Street, Santa Barbara, California 93101 (US).

(72) Inventors: **BATES, Paul**; 1512 Castillo Street, Santa Barbara, California 93101 (US). **KEYSER-ALLEN, Lee**; 25 First Street, Suite 300, Cambridge, Massachusetts 02141 (US). **LANG, Jonathan, P.**; 1147 West Valerio Street, Santa Barbara, California 93101 (US). **ROBERTS, Diane**; 25 First Street, Suite 300, Cambridge, Massachusetts 02141 (US).

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(54) Title: SYSTEMS, METHODS, APPARATUS, AND ARTICLES OF MANUFACTURE TO PROVIDE A CROWD-SOURCED PLAYLIST WITH GUEST ACCESS

(57) Abstract: Systems and methods are provided to offer a restricted playback mode playlist mode to allow one or more participating users to access a host's media playback system and interact with a reduced subset of functions in that system. An example method includes providing, via a local media playback system, a restricted playback mode open to a plurality of participating users, the restricted playback mode providing a subset of playback functions from the local media playback system to the participating users, the subset including addition of content to a playlist for playback via the local media playback system. The example method includes facilitating addition of content to the playlist by at least one participating user. The example method includes facilitating playback of content from the playlist in the restricted playback mode.

# TITLE: SYSTEMS, METHODS, APPARATUS, AND ARTICLES OF MANUFACTURE TO PROVIDE A CROWD-SOURCED PLAYLIST WITH GUEST ACCESS

## FIELD OF THE DISCLOSURE

**[0001]** The disclosure is related to consumer goods and, more particularly, to systems, products, features, services, and other items directed to media playback or some aspect thereof.

## BACKGROUND

**[0002]** Technological advancements have increased the accessibility of music content, as well as other types of media, such as television content, movies, and interactive content. For example, a user can access audio, video, or both audio and video content over the Internet through an online store, an Internet radio station, a music service, a movie service, and so on, in addition to the more traditional avenues of accessing audio and video content. Demand for audio, video, and both audio and video content inside and outside of the home continues to increase.

## BRIEF DESCRIPTION OF THE DRAWINGS

**[0010]** Features, aspects, and advantages of the presently disclosed technology are better understood with regard to the following description, appended claims, and accompanying drawings where:

**[0011]** Figure 1 shows an illustration of an example system in which embodiments of the methods and apparatus disclosed herein can be implemented;

**[0012]** Figure 2A shows an illustration of an example zone player having a built-in amplifier and speakers;

**[0013]** Figure 2B shows an illustration of an example zone player having a built-in amplifier and connected to external speakers;

**[0014]** Figure 2C shows an illustration of an example zone player connected to an A/V receiver and speakers;

**[0015]** Figure 3 shows an illustration of an example controller;

**[0016]** Figure 4 shows an internal functional block diagram of an example zone player;

**[0017]** Figure 5 shows an internal functional block diagram of an example controller;

**[0018]** Figure 6 depicts an example shared listening zone group including multiple zones in which multiple users, via multiple controllers can control music played in the zone group via a plurality of media playback devices;

**[0019]** Figure 7 illustrates a flow diagram of an example method to implement a party playlist mode in a media playback system;

**[0020]** Figure 8 illustrates a flow diagram of an example method to facilitate addition of content to a party playlist.

**[0021]** Figures 9-15 illustrate example user interfaces facilitating content selection, playback and configuration in a party playlist mode.

**[0022]** In addition, the drawings are for the purpose of illustrating example embodiments, but it is understood that the present disclosure is not limited to the arrangements and instrumentality shown in the drawings.

## DETAILED DESCRIPTION

### I. Overview

**[0023]** Listening to audio content out loud can be a social activity that involves family, friends, or both. Audio content may include, for instance, music, talk radio, books, audio from television, and other audible material. For example, in a household, people may play music out loud at parties and other social gatherings. In such an environment, people may wish to play the music in one listening zone or multiple listening zones simultaneously, such that the music in each listening zone may be synchronized, without audible echoes or glitches. Such an experience may be further enriched when people, for example, browse audio sources, add a music track to a playback queue, learn more about a music track (such as track title or track artists), or view what music track is next in the playback queue.

**[0024]** Listening to audio content out loud can also be an individual experience. For example, an individual may play music out loud for themselves in the morning before work, in the evening during dinner, or at other times throughout the day at home, work, or on the road. For these individual experiences, the individual may choose to either use headphones, or limit the out loud playback of audio content to a single zone or area.

**[0025]** Discovery of audio can also be an important element of the experience. By way of illustration, discovery may involve friends sharing their latest favorite new song, artist, or playlist with each other. In some cases, discovery may involve browsing music magazines and periodicals that regularly review the latest releases. In addition, some online music services, radio stations, and disc jockeys are also means for people to share and discover new music or audio.

**[0026]** Example systems, methods, apparatus, and articles of manufacture disclosed herein provide for configuration of a playback system in a restricted access mode (e.g., a party playlist mode) in which authorized or other participating users can access and interact with a certain specified set of content and system function. For example, an authorized user can view a library of available content for playback and select content to be added to the playlist (e.g., perhaps subject to approval of the host/moderator and/or a vote of other participants). Example systems and methods disclosed and described herein may be advantageously used to provide improved

usability and configurability for varied playback of media content (e.g., audio and/or video) in a network environment.

**[0027]** Many other embodiments are provided and described herein.

## II. An Example Operating Environment

**[0028]** Referring now to the drawings, in which like numerals can refer to like parts throughout the figures, Figure 1 shows an example system 100 in which one or more embodiments disclosed herein can be practiced or implemented.

**[0029]** By way of illustration, system 100 represents a home presently configured with multiple zones, though the home could have been configured with only one zone. Each zone in the home, for example, may represent a different room or space, such as an office, bathroom, bedroom, kitchen, dining room, family room, home theater room, utility or laundry room, and patio. A single zone might also include multiple rooms if so configured. One or more of zone players 102-124 are shown in each respective zone of the home. A zone player 102-124, also referred to as a playback device, multimedia unit, speaker, player, and so on, provides audio, video, and/or audiovisual output. Controller 130 provides control to system 100. Controller 130 may be fixed to a zone, or alternatively, mobile such that it can be moved about the zones. System 100 may also include more than one controller 130. System 100 illustrates an example whole house audio system, though it is understood that the technology described herein is not limited to its particular place of application or to an expansive system like a whole house audio system 100 of Figure 1.

a. Example zone players

**[0030]** Figures 2A, 2B, and 2C show example types of zone players. Zone players 200, 202, and 204 of Figures 2A, 2B, and 2C, respectively, can correspond to any of the zone players 102-124 of Figure 1, for example. In some embodiments, audio is reproduced using only a single zone player, such as by a full-range player. In some embodiments, audio is reproduced using two or more zone players, such as by using a combination of full-range players or a combination of full-range and specialized players. In some embodiments, zone players 200-204 may also be referred to as a "smart speaker," because they contain processing capabilities beyond the reproduction of audio, more of which is described below.

**[0031]** Figure 2A illustrates zone player 200 that includes sound producing equipment 208 capable of reproducing full-range sound. The sound may come from an audio signal that is received and processed by zone player 200 over a wired or wireless data network. Sound producing equipment 208 includes one or more built-in amplifiers and one or more speakers. A built-in amplifier is described more below with respect to Figure 4. A speaker or acoustic transducer can include, for example, any of a tweeter, a mid-range driver, a low-range driver, and a subwoofer. In some embodiments, zone player 200 can be statically or dynamically configured to play stereophonic audio, monaural audio, or both. In some embodiments, zone player 200 is configured to reproduce a subset of full-range sound, such as when zone player 200 is grouped with other zone players to play stereophonic audio, monaural audio, and/or surround audio or when the audio content received by zone player 200 is less than full-range.

**[0032]** Figure 2B illustrates zone player 202 that includes a built-in amplifier to power a set of detached speakers 210. A detached speaker can include, for example, any type of loudspeaker. Zone player 202 may be configured to power one, two, or more separate loudspeakers. Zone player 202 may be configured to communicate an audio signal (e.g., right and left channel audio or more channels depending on its configuration) to the detached speakers 210 via a wired path.

**[0033]** Figure 2C illustrates zone player 204 that does not include a built-in amplifier, but is configured to communicate an audio signal, received over a data network, to an audio (or "audio/video") receiver 214 with built-in amplification.

**[0034]** Referring back to Figure 1, in some embodiments, one, some, or all of the zone players 102 to 124 can retrieve audio directly from a source. For example, a zone player may contain a playlist or queue of audio items to be played (also referred to herein as a "playback queue"). Each item in the queue may comprise a uniform resource identifier (URI) or some other identifier. The URI or identifier can point the zone player to the audio source. The source might be found on the Internet (e.g., the cloud), locally from another device over data network 128, the controller 130, stored on the zone player itself, or from an audio source communicating directly to the zone player. In some embodiments, the zone player can reproduce the audio itself, send it to another zone player for reproduction, or both where the audio is played by the zone player and one or more additional zone players in synchrony. In some embodiments, the zone player can

play a first audio content (or not play at all), while sending a second, different audio content to another zone player(s) for reproduction.

**[0035]** By way of illustration, SONOS, Inc. of Santa Barbara, California presently offers for sale zone players referred to as a "PLAY:5," "PLAY:3," "CONNECT:AMP," "CONNECT," and "SUB." Any other past, present, and/or future zone players can additionally or alternatively be used to implement the zone players of example embodiments disclosed herein. Additionally, it is understood that a zone player is not limited to the particular examples illustrated in Figures 2A, 2B, and 2C or to the SONOS product offerings. For example, a zone player may include a wired or wireless headphone. In yet another example, a zone player might include a sound bar for television. In yet another example, a zone player can include or interact with a docking station for an Apple IPOD™ or similar device.

b. Example controllers

**[0036]** Figure 3 illustrates an example wireless controller 300 in docking station 302. By way of illustration, controller 300 can correspond to controlling device 130 of Figure 1. Docking station 302, if provided, may be used to charge a battery of controller 300. In some embodiments, controller 300 is provided with a touch screen 304 that allows a user to interact through touch with the controller 300, for example, to retrieve and navigate a playlist of audio items, control operations of one or more zone players, and provide overall control of the system configuration 100. In certain embodiments, any number of controllers can be used to control the system configuration 100. In some embodiments, there can be a limit set on the number of controllers that can control the system configuration 100. The controllers might be wireless like wireless controller 300 or wired to data network 128.

**[0037]** In some embodiments, if more than one controller is used in system 100, then each controller may be coordinated to display common content, and may all be dynamically updated to indicate changes made from a single controller. Coordination can occur, for instance, by a controller periodically requesting state information directly or indirectly from one or more zone players; the state information may provide information about system 100, such as current zone group configuration, what is playing in one or more zones, volume levels, and other items of interest. The state information may be passed around on data network 128 between zone players (and controllers, if so desired) as needed or as often as programmed.

**[0038]** In addition, an application running on any network-enabled portable device, such as an IPHONE™, IPAD™, ANDROID™ powered phone, or any other smart phone or network-enabled device can be used as controller 130. An application running on a laptop or desktop personal computer (PC) or MAC™ can also be used as controller 130. Such controllers may connect to system 100 through an interface with data network 128, a zone player, a wireless router, or using some other configured connection path. Example controllers offered by SONOS, Inc. of Santa Barbara, California include a "Controller 200," "SONOS® CONTROL," "SONOS® Controller for IPHONE™," "SONOS® Controller for IPAD™," "SONOS® Controller for ANDROID™, "SONOS® Controller for MAC or PC."

c. Example data connection

**[0039]** Zone players 102 to 124 of Figure 1 are coupled directly or indirectly to a data network, such as data network 128. Controller 130 may also be coupled directly or indirectly to data network 128 or individual zone players. Data network 128 is represented by an octagon in the figure to stand out from other representative components. While data network 128 is shown in a single location, it is understood that such a network is distributed in and around system 100. Particularly, data network 128 can be a wired network, a wireless network, or a combination of both wired and wireless networks. In some embodiments, one or more of the zone players 102-124 are wirelessly coupled to data network 128 based on a proprietary mesh network. In some embodiments, one or more of the zone players 102-124 are wirelessly coupled to data network 128 using a non-mesh topology. In some embodiments, one or more of the zone players 102-124 are coupled via a wire to data network 128 using Ethernet or similar technology. In addition to the one or more zone players 102-124 connecting to data network 128, data network 128 can further allow access to a wide area network, such as the Internet.

**[0040]** In some embodiments, connecting any of the zone players 102-124, or some other connecting device, to a broadband router, can create data network 128. Other zone players 102-124 can then be added wired or wirelessly to the data network 128. For example, a zone player (e.g., any of zone players 102-124) can be added to the system configuration 100 by simply pressing a button on the zone player itself (or perform some other action), which enables a connection to be made to data network 128. The broadband router can be connected to an Internet Service Provider (ISP), for example. The broadband router can be used to form another

data network within the system configuration 100, which can be used in other applications (e.g., web surfing). Data network 128 can also be used in other applications, if so programmed. An example, second network may implement SonosNet protocol, developed by SONOS, Inc. of Santa Barbara. Sonsonate represents a secure, AES-encrypted, peer-to-peer wireless mesh network. Alternatively, in certain embodiments, the data network 128 is the same network, such as a traditional wired or wireless network, used for other applications in the household.

d. Example zone configurations

**[0041]** A particular zone can contain one or more zone players. For example, the family room of Figure 1 contains two zone players 106 and 108, while the kitchen is shown with one zone player 102. In another example, the home theater room contains additional zone players to play audio from a 5.1 channel or greater audio source (e.g., a movie encoded with 5.1 or greater audio channels). In some embodiments, one can position a zone player in a room or space and assign the zone player to a new or existing zone via controller 130. As such, zones may be created, combined with another zone, removed, and given a specific name (e.g., "Kitchen"), if so desired and programmed to do so with controller 130. Moreover, in some embodiments, zone configurations may be dynamically changed even after being configured using controller 130 or some other mechanism.

**[0042]** In some embodiments, if a zone contains two or more zone players, such as the two zone players 106 and 108 in the family room, then the two zone players 106 and 108 can be configured to play the same audio source in synchrony, or the two zone players 106 and 108 can be paired, allowing the separate audio channels to be played by different players, for example. In other words, the stereo effects of a sound can be reproduced or enhanced through the two zone players 106 and 108, one for the left sound and the other for the right sound. In certain embodiments, paired zone players (also referred to as "bonded zone players") can play audio in synchrony with other zone players in the same or different zones.

**[0043]** In some embodiments, two or more zone players can be sonically consolidated to form a single, consolidated zone player. A consolidated zone player (though made up of multiple, separate devices) can be configured to process and reproduce sound differently than an unconsolidated zone player or zone players that are paired, because a consolidated zone player will have additional speaker drivers from which sound can be passed. The consolidated zone

player can further be paired with a single zone player or yet another consolidated zone player. Each playback device of a consolidated playback device can be set in a consolidated mode, for example.

**[0044]** According to some embodiments, one can continue to do any of: group, consolidate, and pair zone players, for example, until a desired configuration is complete. The actions of grouping, consolidation, and pairing are preferably performed through a control interface, such as using controller 130, and not by physically connecting and re-connecting speaker wire, for example, to individual, discrete speakers to create different configurations. As such, certain embodiments described herein provide a more flexible and dynamic platform through which sound reproduction can be offered to the end-user.

e. Example audio sources

**[0045]** In some embodiments, each zone can play from the same audio source as another zone or each zone can play from a different audio source. For example, someone can be grilling on the patio and listening to jazz music via zone player 124, while someone is preparing food in the kitchen and listening to classical music via zone player 102. Further, someone can be in the office listening to the same jazz music via zone player 110 that is playing on the patio via zone player 124. In some embodiments, the jazz music played via zone players 110 and 124 is played in synchrony. Synchronizing playback amongst zones allows for someone to pass through zones while seamlessly (or substantially seamlessly) listening to the audio. Further, zones can be put into a "party mode" such that all associated zones will play audio in synchrony.

**[0046]** Sources of audio content to be played by zone players 102-124 are numerous. In some embodiments, music on a zone player itself may be accessed and a played. In some embodiments, music from a personal library stored on a computer or networked-attached storage (NAS) may be accessed via the data network 128 and played. In some embodiments, Internet radio stations, shows, and podcasts can be accessed via the data network 128. Music or cloud services that let a user stream and/or download music and audio content can be accessed via the data network 128. Further, music can be obtained from traditional sources, such as a turntable or CD player, via a line-in connection to a zone player, for example. Audio content can also be accessed using a different protocol, such as AIRPLAY™, which is a wireless technology by Apple, Inc., for example. Audio content received from one or more sources can be shared

amongst the zone players 102 to 124 via data network 128 and/or controller 130. The above-disclosed sources of audio content are referred to herein as network-based audio information sources. However, network-based audio information sources are not limited thereto.

**[0047]** In some embodiments, the example home theater zone players 116, 118, 120 are coupled to an audio information source such as a television 132. In some examples, the television 132 is used as a source of audio for the home theater zone players 116, 118, 120, while in other examples audio information from the television 132 can be shared with any of the zone players 102-124 in the audio system 100.

## III. Zone Players

**[0048]** Referring now to Figure 4, there is shown an example block diagram of a zone player 400 in accordance with an embodiment. Zone player 400 includes a network interface 402, a processor 408, a memory 410, an audio processing component 412, one or more modules 414, an audio amplifier 416, and a speaker unit 418 coupled to the audio amplifier 416. Figure 2A shows an example illustration of such a zone player. Other types of zone players may not include the speaker unit 418 (e.g., such as shown in Figure 2B) or the audio amplifier 416 (e.g., such as shown in Figure 2C). Further, it is contemplated that the zone player 400 can be integrated into another component. For example, the zone player 400 could be constructed as part of a television, lighting, or some other device for indoor or outdoor use.

**[0049]** In some embodiments, network interface 402 facilitates a data flow between zone player 400 and other devices on a data network 128. In some embodiments, in addition to getting audio from another zone player or device on data network 128, zone player 400 may access audio directly from the audio source, such as over a wide area network or on the local network. In some embodiments, the network interface 402 can further handle the address part of each packet so that it gets to the right destination or intercepts packets destined for the zone player 400. Accordingly, in certain embodiments, each of the packets includes an Internet Protocol (IP)-based source address as well as an IP-based destination address.

**[0050]** In some embodiments, network interface 402 can include one or both of a wireless interface 404 and a wired interface 406. The wireless interface 404, also referred to as a radio frequency (RF) interface, provides network interface functions for the zone player 400 to wirelessly communicate with other devices (e.g., other zone player(s), speaker(s), receiver(s),

component(s) associated with the data network 128, and so on) in accordance with a communication protocol (e.g., any wireless standard including IEEE 802.11a, 802.11b, 802.11g, 802.11n, or 802.15). Wireless interface 404 may include one or more radios. To receive wireless signals and to provide the wireless signals to the wireless interface 404 and to transmit wireless signals, the zone player 400 includes one or more antennas 420. The wired interface 406 provides network interface functions for the zone player 400 to communicate over a wire with other devices in accordance with a communication protocol (e.g., IEEE 802.3). In some embodiments, a zone player includes both of the interfaces 404 and 406. In some embodiments, a zone player 400 includes only the wireless interface 404 or the wired interface 406.

**[0051]** In some embodiments, the processor 408 is a clock-driven electronic device that is configured to process input data according to instructions stored in memory 410. The memory 410 is data storage that can be loaded with one or more software module(s) 414, which can be executed by the processor 408 to achieve certain tasks. In the illustrated embodiment, the memory 410 is a tangible machine-readable medium storing instructions that can be executed by the processor 408. In some embodiments, a task might be for the zone player 400 to retrieve audio data from another zone player or a device on a network (e.g., using a uniform resource locator (URL) or some other identifier). In some embodiments, a task may be for the zone player 400 to send audio data to another zone player or device on a network. In some embodiments, a task may be for the zone player 400 to synchronize playback of audio with one or more additional zone players. In some embodiments, a task may be to pair the zone player 400 with one or more zone players to create a multi-channel audio environment. Additional or alternative tasks can be achieved via the one or more software module(s) 414 and the processor 408.

**[0052]** The audio processing component 412 can include one or more digital-to-analog converters (DAC), an audio preprocessing component, an audio enhancement component or a digital signal processor, and so on. In some embodiments, the audio processing component 412 may be part of processor 408. In some embodiments, the audio that is retrieved via the network interface 402 is processed and/or intentionally altered by the audio processing component 412. Further, the audio processing component 412 can produce analog audio signals. The processed analog audio signals are then provided to the audio amplifier 416 for play back through speakers 418. In addition, the audio processing component 412 can include circuitry to process analog or digital signals as inputs to play from zone player 400, send to another zone player on a network,

or both play and send to another zone player on the network. An example input includes a line-in connection (e.g., an auto-detecting 3.5mm audio line-in connection).

**[0053]** The audio amplifier 416 is a device(s) that amplifies audio signals to a level for driving one or more speakers 418. The one or more speakers 418 can include an individual transducer (e.g., a "driver") or a complete speaker system that includes an enclosure including one or more drivers. A particular driver can be a subwoofer (e.g., for low frequencies), a mid-range driver (e.g., for middle frequencies), and a tweeter (e.g., for high frequencies), for example. An enclosure can be sealed or ported, for example. Each transducer may be driven by its own individual amplifier.

**[0054]** A commercial example, presently known as the PLAY:5, is a zone player with a built-in amplifier and speakers that is capable of retrieving audio directly from the source, such as on the Internet or on the local network, for example. In particular, the PLAY:5 is a five-amp, five-driver speaker system that includes two tweeters, two mid-range drivers, and one woofer. When playing audio content via the PLAY:5, the left audio data of a track is sent out of the left tweeter and left mid-range driver, the right audio data of a track is sent out of the right tweeter and the right mid-range driver, and mono bass is sent out of the subwoofer. Further, both mid-range drivers and both tweeters have the same equalization (or substantially the same equalization). That is, they are both sent the same frequencies, but from different channels of audio. Audio from Internet radio stations, online music and video services, downloaded music, analog audio inputs, television, DVD, and so on, can be played from the PLAY:5.

## IV. Controller

**[0055]** Referring now to Figure 5, there is shown an example block diagram for controller 500, which can correspond to the controlling device 130 in Figure 1. Controller 500 can be used to facilitate the control of multi-media applications, automation and others in a system. In particular, the controller 500 may be configured to facilitate a selection of a plurality of audio sources available on the network and enable control of one or more zone players (e.g., the zone players 102-124 in Figure 1) through a wireless or wired network interface 508. According to one embodiment, the wireless communications is based on an industry standard (e.g., infrared, radio, wireless standard including IEEE 802.11a, 802.11b 802.11g, 802.11n, or 802.15, and so on). Further, when a particular audio is being accessed via the controller 500 or being played via

a zone player, a picture (e.g., album art) or any other data, associated with the audio and/or audio source can be transmitted from a zone player or other electronic device to controller 500 for display.

**[0056]** Controller 500 is provided with a screen 502 and an input interface 514 that allows a user to interact with the controller 500, for example, to navigate a playlist of many multimedia items and to control operations of one or more zone players. The screen 502 on the controller 500 can be an LCD screen, for example. The screen 500 communicates with and is commanded by a screen driver 504 that is controlled by a microcontroller (e.g., a processor) 506. The memory 510 can be loaded with one or more application modules 512 that can be executed by the microcontroller 506 with or without a user input via the user interface 514 to achieve certain tasks. In some embodiments, an application module 512 is configured to facilitate grouping a number of selected zone players into a zone group and synchronizing the zone players for audio play back. In some embodiments, an application module 512 is configured to control the audio sounds (e.g., volume) of the zone players in a zone group. In operation, when the microcontroller 506 executes one or more of the application modules 512, the screen driver 504 generates control signals to drive the screen 502 to display an application specific user interface accordingly.

**[0057]** The controller 500 includes a network interface 508 that facilitates wired or wireless communication with a zone player. In some embodiments, the commands such as volume control and audio playback synchronization are sent via the network interface 508. In some embodiments, a saved zone group configuration is transmitted between a zone player and a controller via the network interface 508. The controller 500 can control one or more zone players, such as 102-124 of Figure 1. There can be more than one controller for a particular system, and each controller may share common information with another controller, or retrieve the common information from a zone player, if such a zone player stores configuration data (e.g., such as state information). Further, a controller can be integrated into a zone player.

**[0058]** It should be noted that other network-enabled devices such as an IPHONE®, IPAD® or any other smart phone or network-enabled device (e.g., a networked computer such as a PC or MAC®) can also be used as a controller to interact or control zone players in a particular environment. In some embodiments, a software application or upgrade can be downloaded onto a network-enabled device to perform the functions described herein.

**[0059]** In certain embodiments, a user can create a group or collection of zones referred to as a bonded zone including at least two zone players from the controller 500. The zone players in the bonded zone can play audio in a synchronized fashion, such that all of the zone players in the group play back an identical audio source or a list of identical audio sources in a synchronized manner such that no (or substantially no) audible delays or hiccups are to be heard. Similarly, in some embodiments, when a user increases the audio volume of the group from the controller 500, the signals or data of increasing the audio volume for the group are sent to one of the zone players and causes other zone players in the group to be increased together in volume.

**[0060]** A user via the controller 500 can group zone players into a zone group by activating a "Link Zones" or "Add Zone" soft button, or de-grouping a zone group by activating an "Unlink Zones" or "Drop Zone" button. For example, one mechanism for 'joining' zone players together for audio play back is to link a number of zone players together to form a group. To link a number of zone players together, a user can manually link each zone player or room one after the other. For example, assume that there is a multi-zone system that includes the following zones: Bathroom, Bedroom, Den, Dining Room, Family Room, and Foyer.

**[0061]** In certain embodiments, a user can link any number of the zone players (e.g., six zone players available in the example above), for example, by starting with a single zone and then manually linking each zone to that zone.

**[0062]** In certain embodiments, a set of zones can be dynamically linked together using a command to create a zone scene or theme (subsequent to first creating the zone scene). For instance, a "Morning" zone scene command can link the Bedroom, Office, and Kitchen zones together in one action. Without this single command, the user would manually and individually link each zone. The single command may include a mouse click, a double mouse click, a button press, a gesture, or some other programmed action. Other kinds of zone scenes can be programmed.

**[0063]** In certain embodiments, a zone scene can be triggered based on time (e.g., an alarm clock function). For instance, a zone scene can be set to apply at 8:00 am. The system can link appropriate zones automatically, set specific music to play, and then stop the music after a defined duration. Although any particular zone can be triggered to an "On" or "Off" state based on time, for example, a zone scene enables any zone(s) linked to the scene to play a predefined

audio (e.g., a favorable song, a predefined playlist) at a specific time and/or for a specific duration. If, for any reason, the scheduled music failed to be played (e.g., an empty playlist, no connection to a share, failed Universal Plug and Play (UPnP), no Internet connection for an Internet Radio station, and so on), a backup buzzer can be programmed to sound. The buzzer can include a sound file that is stored in a zone player, for example.

## V. Example Configuration Systems and Methods

**[0064]** In an example system such as the ones shown in Figures 1 and 6, where multiple users can listen to the same audio content through one or more zone players such as those shown in Figures 2 and 4, the ability to provide crowd-sourced playlists and/or facilitate guest access to music services may be valuable.

**[0065]** An example system is shown in Figure 6, whereby a zone group 600 includes two zones, a Dining Room zone 610 and a Living Room zone 620, in which multiple users, via multiple controllers 630-633, can control the audio that is played in the zone group 600 via a plurality of playback devices 640-642 (e.g., a plurality of zone players and/or other media playback devices such as shown and described in Figures 1-4). As shown in the example of Figure 6, a media playback system can be configured to accept control and/or other input from multiple controllers 630-633, such as a controller 500, a smartphone, a tablet computer, a laptop computer, and/or other controlling device. Control, however, may be limited or otherwise restricted according to system permissions, preferences, etc., set by default, by owner, and so on.

**[0066]** In certain embodiments, a party playlist mode enables users with a phone or other controller (e.g., other device running a controller software application, etc.) that has access to the playback network to control music playback. In some embodiments, playback control includes adding content to a playback system, such as adding content to a playback queue (e.g., party playlist). In other embodiments, playback control includes moderation of content playback, such as moderating the content added to the party playlist. In some embodiments, the party playlist mode can facilitate moderation of content playback to users with a phone or other controller that has access to the playback network. In some embodiments, moderation of content playback can start with a single moderator and evolve to multiple moderators as time evolves (e.g., as the party goes on), for example. In one example embodiment, people with access to the playback network can be notified when new tracks are added and be asked to vote regarding addition of the track to

the playlist. In another example embodiment, the order or timing of the newly added track in the playlist can be voted on as well by people with access to the playback network.

**[0067]** In certain embodiments, playlist contributors are identified with the tracks they add and the identification of the contributors is shared with everyone to view. In this way, for example, listeners can know who added which song or track to the party playlist. In one example embodiment, the playlist contributor is not identified until their contribution has been accepted into the party playlist.

**[0068]** Certain embodiments provide guest access to allow participants in the playback system to bring their own content to the system on a temporary basis. For example, people can provide access to their music service accounts, the content on their mobile phones, their content stored in the cloud, and so on, for a temporary basis.

**[0069]** In certain embodiments, duplicate tracks or songs being added to the party playlist can be identified and rejected. For example, multiple users may simultaneously (or substantially simultaneously) add the same song or track to the playlist. To avoid multiple occurrences of the same song or track, the system can automatically reject duplicates.

**[0070]** Certain embodiments provide limited user access to control music playback in a shared environment. In some embodiments limited user access may apply restrictions on an entire media playback system, a single listening zone, and/or a listening zone group. In some example embodiments, limited user access may include restricting playback in certain specified listening zones and/or zone groups. In another example embodiment, limited user access may include restricting playback for a fixed time interval, during a particular time-of-day, and/or on a recurring basis.

**[0071]** In an example embodiment, limited user access includes a party playlist that gives limited access to play control of a particular listening zone and/or group of zones. For example, the party playlist may limit users to only adding songs or tracks to the playlist, whereas other functionality in the listening zone or zone group may be disabled. In another example, the party playlist may allow users to collectively decide (e.g., vote) if a new song or track should be added to the playlist, for example. In another example, the party playlist may also limit system configuration functionality, such as the zone grouping configuration, the music equalization

parameters, etc. In some example embodiments, the party playlist may only be in effect for a fixed time duration, and not require explicit disabling operation.

**[0072]** In an example embodiment, limited user access may be applied based on authentication of the user. For example, limited user access may be applied based on authentication of a controlling device which may include registration of the controlling device and its associated identifier. In another example, authentication may include all controller devices used in the media playback system over a defined time interval (e.g., a previous twenty-four (24) hours).

**[0073]** Certain embodiments provide shared music access for a limited time duration in a group listening environment. Shared music may be a library of tracks or a playlist on a physical device that is accessed wirelessly by the media playback system, for example. Shared music may be a subscription service accessed independently over the Internet and/or other network, for example (e.g., a cloud-based storage, music streaming service, etc.). Subscription service credentials may be passed directly to a playback system device, for example. Subscription service may be username/password or token, for example.

**[0074]** While illustrative examples provided below reference music or audio as content provided, video, images and/or other multimedia content may be provided in addition or instead.

**[0075]** Crowd-Sourced Playlist

**[0076]** In some embodiments, one or more users can create a multimedia playlist. For example, a 'party playlist' mode is provided to allow multiple users to add tracks to a queue for playback via a media playback system.

**[0077]** A media playback system can be put into party playlist mode by an authenticated user. In an example, the user is to "sign in" such as by entering a username, a password, or a username/password combination to be authenticated. In another example, the user may be authenticated by identifying a device used to control the system (e.g., the device may be identified by a unique identifier (ID) such as a Media Access Control (MAC) address that has been registered in the playback system). For example, a SONOS™ controller may be considered such a device, or a device with a SONOS™ controller application may be registered as such a device. In another example, "Jonathan's IPHONE™" may be considered such a device if the target playback system is Jonathan's SONOS™ system. In yet another example, devices that

have been used with respect to the media playback system within a certain time period (e.g., in a twenty-four (24)-hour period) may be considered registered. Alternatively, the playback system may be put into party playlist mode by anyone with access to the playback system.

**[0078]** The party playlist mode may be set to last for a fixed duration of time (e.g., four (4) hours), for example. The party playlist mode may be set to end at a specific time of day (e.g., 1 am), for example. The party playlist mode may last indefinitely until a user manually exits the mode, for example. In an embodiment, a password is generated when the playback system is put in party playlist mode and is used to exit party playlist mode. In another embodiment, no authentication is required to take the system out of party playlist mode.

**[0079]** Party playlist mode may apply to a single zone or zone grouping, multiple zones or zone groupings, or the entire media playback system, for example.

**[0080]** Once the system is put into party playlist mode, in some embodiments, users can only add music to the listening queue. Deleting tracks, changing the play mode (e.g., shuffle, repeat, etc.), or changing the system settings (e.g., zone group configuration, music equalization parameters, etc.) is not allowed. In some embodiments, some or all of the following rules or limitations are applied: an ability to modify content may be limited, an ability to affect order may be limited, an ability to adjust system configuration may be limited, and so on. For example, rules and/or other access permissions may limit whether anyone can add songs to the party playlist, no one can remove songs from the party playlist, only one song may be added at a time (rather than adding an entire album or set of content in a single action), etc. Artist repetition may be avoided by limiting a number of songs in the queue by the same artist, for example. Songs in the queue may be played randomly and/or in a predefined order, for example. In certain examples, once a song is played, the song is removed from the queue. In certain examples, no user can switch sources or change a zone grouping in party playlist mode. In other examples, certain users may be able to switch sources or change a zone grouping in party playlist mode.

**[0081]** A visual history of recently played tracks can be accessed and shown to users via a control device, for example. In certain embodiments, a graphical "Jukebox" screen can be shown on the control device.

**[0082]** In an embodiment, a method is used to determine if a new track should be added to the playlist. In an embodiment, all tracks are added to the playlist in an unrestricted fashion. In

another embodiment, the playlist is moderated by an "owner" of the media playback system. In another embodiment, the playlist is moderated by the crowd or collection of users. For example, when a user attempts to add a track to the playlist, notification is sent to users in the crowd. Notification can be in the form of an application-based notification (e.g., a notification message within a Sonos application), a text message, an instant message, or some other messaging scheme. Any number of users can be selected to participate in the moderation, and the user selection may be at random when a subset of the crowd is selected. Once notification is sent to the users to vote, they are given a fixed time duration (e.g., two (2) minutes) to vote on adding the track to the listening queue. The system can use a majority-rule to determine if the track is added or not. In certain embodiments, certain role(s) (e.g., a disc jockey (DJ), host, organizer, etc.) may have discretion or take priority to add or approve addition of a track to the party playlist, for example.

**[0083]** In an example in which duplicate songs are not allowed, multiple users may try to add the same track or song to the queue. In an embodiment, duplicate tracks are identified by comparing the source location and track identifiers. In another embodiment, duplicate tracks are identified by comparing the metadata (e.g., artist, track name, length of track, etc.) between the tracks. In yet another embodiment, duplicate tracks are identified by comparing the musical composition of both tracks. The comparison may be done directly in the system or via a service hosted locally or in the Internet "cloud", for example.

**[0084]** In an embodiment, the user or users that add a track to the queue are identified for others to see. In an embodiment, the user or users that add the track are identified in the queue alongside the track name. In another embodiment, the user or users that add the track are identified by drilling down (e.g., double-click, touch, hover over, etc.) on the track name.

**[0085]** In an embodiment, authentication mechanisms as described above may be used to identify the user or users that added the track. In another embodiment, the user may be asked to enter a name along with the track to be added.

**[0086]** In an embodiment, the user who added the track to the playlist is notified if the track has been successfully added or rejected from the listening queue.

**[0087]** Guest Access

**[0088]** In an example media playback system, music that is added to the party playlist can come from many different sources. In an embodiment, music can be selected from sources already associated with the playback system. Already-associated sources may include an indexed music library that is on a Local Area Network (e.g., music stored on a PC or MAC™ computer, a network attached storage device, a docked IPOD™ or IPHONE™, or another wired or wireless device that has been indexed as part of the playback system), an indexed music library that is stored in the "cloud" over the Internet (e.g., a cloud-based music storage such as Apple ICLOUD™ or Amazon Cloud Player, etc.), or an Internet music service that provides streaming content over the Internet (e.g., PANDORA™, RHAPSODY™, SPOTIFY™, etc.) . In another embodiment, the music can be played to the media playback system (e.g., a SONOS™ system) from a third party software application such as SPOTIFY™ or FACEBOOK™. In another embodiment, the music can be played directly from the device on which the content resides (e.g., music stored on an IPHONE™, IPAD™, IPOD™, or ANDROID™ device).

**[0089]** In another embodiment, a 'guest pass' mode allows users to share their music services with other users in the crowd on a temporary basis. For example, users may want to share their SPOTIFY™ account temporarily if the playback system does not have a SPOTIFY™ account already associated with the system. In another example, users wanting to share a personal playlist may want to share their SPOTIFY™ account temporarily even if the system already has a SPOTIFY™ account associated with it. In an embodiment, guest access requires the guest to be linked to the playback system. In an embodiment, the guest is linked to the playback system using a configuration sequence including a special button press on a system device. When the guest is linked to the playback system as a guest, user credentials (e.g., username/password, token, etc.) are transferred to the playback system from the user in a secure fashion. The user credentials are used to register the playback system with a music service, for example. In an embodiment, the user credentials are passed directly to a media playback system device using wired or wireless communication. In another embodiment, the user credentials are transmitted to a media playback system device from a mobile device by first connecting through the mobile network (e.g., a 3G or 4G network) and then connecting to the playback system through an Internet or other network connection. Guest access may be set to last for a fixed duration of time (e.g., four (4) hours). Guest access may be set to end at a specific time of day (e.g., 1 am). Guest access may last as long as the user is connected to the network, or it may last indefinitely until a

user manually exits the mode. In an embodiment, when guest access is terminated, the user credentials are purged from the system.

**[0090]** In certain embodiments, guest credentials (e.g., password) shall not be retrievable from the system. An owner of the account, however, may allow a 'user id' to be displayed by the system on controllers in certain circumstances (e.g., associated with a song playing from their account, similar to above user attribution). In an example, guest access may be terminated via a refutation mechanism that does not require the guest still be attached to the hosting system or on the local network. This could be via an Internet online multimedia authorization protocol (OMAP) or similar protocol using an Internet connection (including a mobile connection), for example.

**[0091]** Restricted Mode

**[0092]** In some embodiments, the example media playback system includes one or more restrictions that limit access to control music playback. Certain embodiments include a 'restricted' mode that limits users to certain functionality. In the example playback system described and disclosed above, the party playlist mode may limit user access to adding tracks to a listening queue, for example. In another example system, users are limited as to a time of day at which they can control the playback of music. In another example system, users are limited as to the zones or zone groups that they can control. For example, in a household with young children, parents may wish to limit their children to playback control only in the living room and the children's bedroom(s). In another example, parents may want to limit their children to playback control only during the hours of 9am to 7pm. In another example, parents may want to do both: limit their children to playback control only during the hours of 9am to 7pm and also only in the living room and child bedroom(s). In another example system, users are limited to the type of content that they can play. In some embodiments, the content is limited by the playback system using an "explicit" tag embedded in a digital music file. In another embodiment, the content is limited by the system to the location of the source or the streaming service.

**[0093]** In certain embodiments, a user may be limited in a number of tracks that the user can add to the queue. For example, the host can allot or credit the user with a number of tracks to be added, such as by selecting the user's controller from a list of linked controllers, by providing the user with a token or activation code, and so on. Each song added by the user to the party playlist

is deducted from the user's allotment or credit, for example. In an embodiment, the host is a business establishment, and the user is a customer of that establishment. The customer can influence the playlist at the establishment as they would with a traditional jukebox, for example.

**[0094]** Example Party Playlist Methods

**[0095]** Figure 7 illustrates a flow diagram of an example method 700 to implement a party playlist mode in a media playback system. At block 710, a playback or "Now Playing" screen is displayed. For example, a listing of a playlist and currently playing song can be displayed via a controller, such as controller 500 (e.g., a controller application running on an IPHONE™, ANDROID™, or IPAD™).

**[0096]** At block 720, a party playlist mode is selected. The mode may be manually selected by a user or selected according to a schedule and/or other automated trigger. For example, the user may select an option via a controller to trigger entry into the party playlist mode. In another example, a user may schedule the party playlist mode to begin at a certain time on a certain day for a party. At block 730, a user is authenticated to determine authorization of that user to enter the party playlist mode. For example, the user is authenticated based on a username and password, token, password alone, biometric identification, and so on. In another example, the user is authenticated based on the identification of the controller that is being used.

**[0097]** At block 740, the media playback system enters party playlist mode. In party playlist mode, user(s) (e.g., all users within range (e.g., at a party), authorized users, etc.) can add content to the party playlist for playback via a local playback system (e.g., a household SONOS™ system local to the party). In certain embodiments, in party playlist mode, user(s) can specify priority/order of content. In certain embodiments, in party playlist mode, user(s) can specify a zone (re)configuration, for example. In certain embodiments, in party playlist mode, user(s) can specify volume and/or other parameters (e.g., in general and/or associated with their particular added track(s)). In certain embodiments, changes made by a user may be subject to approval and/or override (e.g., by a host/owner/administrator, by a vote of participants, etc.).

**[0098]** In certain embodiments, a remote user can add content to the playlist queue. For example, a party host can give a remote user access to modify the party playlist (e.g., the host can message her old college roommate to ask about the song they loved to dance to in college and ask her old roommate to remotely add the song from her collection to the host's playlist,

etc.). Remote adding of content to the party playlist can be facilitated by providing a content identifier (e.g., a song name), a copy of the content, etc.

**[0099]** At block 750, an exit from party playlist mode is selected. The mode may be may be manually selected by a user or selected according to a schedule and/or other automated trigger. For example, the user may select an option via a controller to trigger exit from the party playlist mode. In another example, a user may schedule the party playlist mode to end at a certain time on a certain day. At block 760, a user is authenticated to determine authorization of that user to exit the party playlist mode. For example, the user is authenticated based on a username and password, token, password alone, biometric identification, and so on. In another example, the user is authenticated based on the identification of the controller that is being used. Once the playback system has exited the party playlist mode, normal operation of the playback system can resume.

**[00100]** Figure 8 illustrates a flow diagram of an example method 800 to facilitate addition of content to a party playlist. At block 810, the local playback system waits for a user to add content to the party playlist. For example, a guest at a party may be given access to modify the playlist or queue of content for playback via the host's local playback system (e.g., household playback system, nightclub playback system, business playback system, etc.). Guest user access can be validated and/or otherwise authenticated to determine authorization to access the party playlist, for example.

**[00101]** At block 820, content is added by the user to the party playlist. For example, the user utilizes a controller, such as controller 500 (e.g., a controller application running on a smartphone or tablet computer), to browse/search, select, and add content to the party playlist. In certain embodiments, the user is given access (perhaps limited) to the host's content for addition to the playlist. In certain embodiments, the user is able to access his or her own content for referral and/or addition to the playlist. In certain embodiments, the user is able to access one or more streaming and/or cloud-based content services to route content to the party playlist.

**[00102]** At block 830, participating users are identified. For example, if a plurality of people attending a party has access to the party playlist via one or more controllers, the plurality of people are identified as participating users. Participating users may be identified based on

controller, user authentication, user registration, activity with respect to the playlist or other part of the local playback system, etc.

**[00103]** At block 840, based on criteria the host provides (e.g., a number of participating (e.g., controlling) users are present above a threshold), then a message is sent to the users to vote. For example, the host can set a threshold above which users can vote on addition and/or other adjustment of content to the party playlist. The number of participating users can be set by default, for example. The number of users may be more than one, for example.

**[00104]** At block 850, the voting users determine if the content is added to the party playlist. For example, each eligible voting user receives a message and request to vote via a controller (e.g., a smartphone or tablet controller application, etc.) associated with that user. In certain embodiments, a voting scheme can be configured, such as a simple majority and/or other voting scheme. In certain embodiments, a moderator, such as a host or disc jockey, can override a user vote.

**[00105]** At block 860, if user voting is not employed, if too few votes are cast, or if the host elects for other reason(s), a moderator (e.g., the host) decides whether the content is to be added to the party playlist. For example, if only one participating user is present and/or the minimum number set in the system is not satisfied, then the moderator/host arbitrates the addition of content to the party playlist. As another example, the moderator/host may override or veto the vote of participating users.

**[00106]** At block 870, the requesting user is notified of the decision regarding the content to be added. Such notification may include comments and/or additional information including, for example, the vote tally, moderator comments, etc. For example, a user attempting to add a song to the party playlist is sent a message notifying him/her regarding whether the song was successfully added or rejected with respect to the party playlist.

**[00107]** The playback system then resumes waiting, in party playlist mode, for a user to request content to be added to the party playlist. Although the example of Figure 8 has been described with respect to content (e.g., audio, video, and/or other media content), it is understood that the example method 800 can be executed with respect to zone group configuration, volume and/or other parameter settings, and so on for the local playback system in party mode.

**[00108]** Figures 9-15 illustrate an example sequence of user interfaces facilitating content selection, playback and configuration in a party playlist mode. As shown in the example of Figure 9, a user interface 900 includes a list or other set of audio tracks available to be selected for a playlist in a party playlist mode, for example. In Figure 9, a playback queue can be found at 902. In this example, the playback queue 902 corresponds to the "Office" zone 906. Also in Figure 9, a play indicator 904 appears to the left of the item currently playing in the playback queue (e.g., currently a pause symbol is shown that indicates the user can pause the play by selecting the symbol). When the current item ends, the next item in the queue starts to play, and play continues through the list until the queue is completed or some other action like "repeat" is selected.

**[00109]** In Figure 10, a user is asked to create a password 1010 when starting a party playlist mode. For example, a host may be asked to establish a password 1010 and/or other identifier that a participating user is to provide in order to add content to the playlist. In certain embodiments, a password and/or other authorization may be required to enter and/or to exit party playlist mode. In certain embodiments, a host may have a moderator password separate from a participating user password, where each password provides a differing level of access to affect content and/or behavior of the media playback system, for example. As shown in the example of Figure 11, in order to exit party playlist mode, the user (e.g., the host) is to enter a password 1100 and/or other identification via the interface.

**[00110]** Figure 12 shows an example of a restricted set of functions 1210 made available to a participating user in party playlist mode. In the example of Figure 12, a user is provided with options 1210 to add selected content (e.g., track, album, etc.) to a playback queue or retrieve information regarding selected content (e.g., retrieve artist, album, date, etc., for a selected song). Figure 13 shows another example of commands 1310 made available to a participating user who is requesting that content be added to a party playlist. Rather than playing or adding radio stations, in the example of Figure 13, a user is only able to add more music, delete a track he/she added from the playlist, rename, etc. As shown in the example of Figure 14, a party playlist queue can be displayed to a participating user, along with an indication 1410 that the selected zone group is in party playlist or "Jukebox" mode. In the example of Figure 14, a user can add single songs that are to be played randomly from the party playlist. In Figure 15, once party

playlist mode has been exited, the example interface provides a notification 1510 that the party playlist mode is now off.

## VI. Conclusion

**[00111]** As discussed above, systems and methods are provided to offer a restricted playback mode (e.g., a party playlist mode) to allow one or more participating users to access a media playback system and interact with a reduced subset of functions in that system (e.g., add content to a party playlist, vote on content, etc.). The embodiments described herein may be further useful by systems in which a limited-time, group-based access to a subset of available functionality is required or preferred.

**[00112]** Thus certain embodiments provide a method including providing, via a local media playback system, a restricted playback mode open to a plurality of participating users, the restricted playback mode providing a subset of playback functions from the local media playback system to the participating users, the subset including addition of content to a playlist for playback via the local media playback system. The example method includes facilitating addition of content to the playlist by at least one participating user. The example method includes facilitating playback of content from the playlist in the restricted playback mode.

**[00113]** Certain embodiments provide a tangible computer readable storage medium including instructions which, when executed by a processor, are to implement at least a method. The example method includes providing, via a local media playback system, a restricted playback mode open to a plurality of participating users, the restricted playback mode providing a subset of playback functions from the local media playback system to the participating users, the subset including addition of content to a playlist for playback via the local media playback system. The example method includes facilitating addition of content to the playlist by at least one participating user. The example method includes facilitating playback of content from the playlist in the restricted playback mode.

**[00114]** Certain embodiments provide a media playback system including one or more playback devices, each playback device including a processor, a memory and a speaker to output audio content provided to the playback device. The example system includes one or more controllers, each controller to facilitate review and addition of audio content for playback via the one or more playback devices. In the example system, at least one controller is to configure the media

playback system in a restricted playback mode open to a plurality of participating users, the restricted playback mode to provide a subset of playback functions from the media playback system to the participating users, the subset including addition of content to a playlist for playback via the media playback system, the controller to facilitate addition of content to the playlist by at least one participating user and facilitate playback of content from the playlist in the restricted playback mode.

**[00115]** The description discloses various example systems, methods, apparatus, and articles of manufacture including, among other components, firmware and/or software executed on hardware. However, such examples are merely illustrative and should not be considered as limiting. For example, it is contemplated that any or all of these firmware, hardware, and/or software components can be embodied exclusively in hardware, exclusively in software, exclusively in firmware, or in any combination of hardware, software, and/or firmware. Accordingly, while the following describes example systems, methods, apparatus, and/or articles of manufacture, the examples provided are not the only way(s) to implement such systems, methods, apparatus, and/or articles of manufacture.

**[00116]** Additionally, reference herein to "embodiment" means that a particular feature, structure, or characteristic described in connection with the embodiment can be included in at least one example embodiment of the invention. The appearances of this phrase in various places in the specification are not necessarily all referring to the same embodiment, nor are separate or alternative embodiments mutually exclusive of other embodiments. As such, the embodiments described herein, explicitly and implicitly understood by one skilled in the art, can be combined with other embodiments.

**[00117]** The specification is presented largely in terms of illustrative environments, systems, procedures, steps, logic blocks, processing, and other symbolic representations that directly or indirectly resemble the operations of data processing devices coupled to networks. These process descriptions and representations are typically used by those skilled in the art to most effectively convey the substance of their work to others skilled in the art. Numerous specific details are set forth to provide a thorough understanding of the present disclosure. However, it is understood to those skilled in the art that certain embodiments of the present disclosure can be practiced without certain, specific details. In other instances, well known methods, procedures,

components, and circuitry have not been described in detail to avoid unnecessarily obscuring aspects of the embodiments. Accordingly, the scope of the present disclosure is defined by the appended claims rather than the forgoing description of embodiments.

**[00118]** When any of the appended claims are read to cover a purely software and/or firmware implementation, at least one of the elements in at least one example is hereby expressly defined to include a tangible medium such as a memory, DVD, CD, Blu-ray, and so on, storing the software and/or firmware.

## Claims

We claim:

1. A method, comprising:

providing, via a local media playback system, a restricted playback mode open to a plurality of participating users, the restricted playback mode providing a subset of playback functions from the local media playback system to the participating users, the subset including addition of content to a playlist for playback via the local media playback system;

facilitating addition of content to the playlist by at least one participating user; and

facilitating playback of content from the playlist in the restricted playback mode.

2. The method of claim 1, wherein playback of content from the playlist in the restricted playback mode comprises random play of content from the playlist.

3. The method of claim 1, further comprising authenticating the at least one participating user to enable the at least one participating user to add content to the playlist in the restricted playback mode.

4. The method of claim 1, further comprising accepting a vote of the participating users to determine whether content is to be added to the playlist.

5. The method of claim 1, wherein facilitating addition of content further comprises accepting user selection of the content from a list of available content via a graphical user interface.

6. The method of claim 5, wherein the list of available content includes a library of shared music available via a network.

7. The method of claim 1, wherein the restricted playback mode is initiated and ended by a host user according to user authorization.

8. The method of claim 1, further comprising configuring the restricted playback mode for a fixed time interval.

9. The method of claim 1, wherein the restricted playback mode includes a specified configuration of zones.

10. The method of claim 1, wherein the subset of playback functions further includes limited user interaction with at least one of zone configuration and content playback parameters.

11. A tangible computer readable storage medium including instructions which, when executed by a processor, are to implement at least a method, the method comprising:

providing, via a local media playback system, a restricted playback mode open to a plurality of participating users, the restricted playback mode providing a subset of playback functions from the local media playback system to the participating users, the subset including addition of content to a playlist for playback via the local media playback system;

facilitating addition of content to the playlist by at least one participating user; and

facilitating playback of content from the playlist in the restricted playback mode.

12. The computer readable storage medium of claim 11, wherein playback of content from the playlist in the restricted playback mode comprises random play of content from the playlist.

13. The computer readable storage medium of claim 11, wherein the method further comprises authenticating the at least one participating user to enable the at least one participating user to add content to the playlist in the restricted playback mode.

14. The computer readable storage medium of claim 11, wherein the method further comprises accepting a vote of the participating users to determine whether content is to be added to the playlist.

15. The computer readable storage medium of claim 11, wherein facilitating addition of content further comprises accepting user selection of the content from a list of available content via a graphical user interface.

16. The computer readable storage medium of claim 15, wherein the list of available content includes a library of shared music available via a network.

17. The computer readable storage medium of claim 11, wherein the restricted playback mode is initiated and ended by a host user according to user authorization.

18. The computer readable storage medium of claim 11, wherein the method further comprises configuring the restricted playback mode for a fixed time interval.

19. The computer readable storage medium of claim 11, wherein the restricted playback mode includes a specified configuration of zones.

20. The computer readable storage medium of claim 11, wherein the subset of playback functions further includes limited user interaction with at least one of zone configuration and content playback parameters.

21. A media playback system comprising:

one or more playback devices, each playback device including a processor, a memory and a speaker to output audio content provided to the playback device;

one or more controllers, each controller to facilitate review and addition of audio content for playback via the one or more playback devices,

wherein at least one controller is to configure the media playback system in a restricted playback mode open to a plurality of participating users, the restricted playback mode to provide a subset of playback functions from the media playback system to the participating users, the subset including addition of content to a playlist for playback via the media playback system, the controller to facilitate addition of content to the playlist by at least one participating user and facilitate playback of content from the playlist in the restricted playback mode.

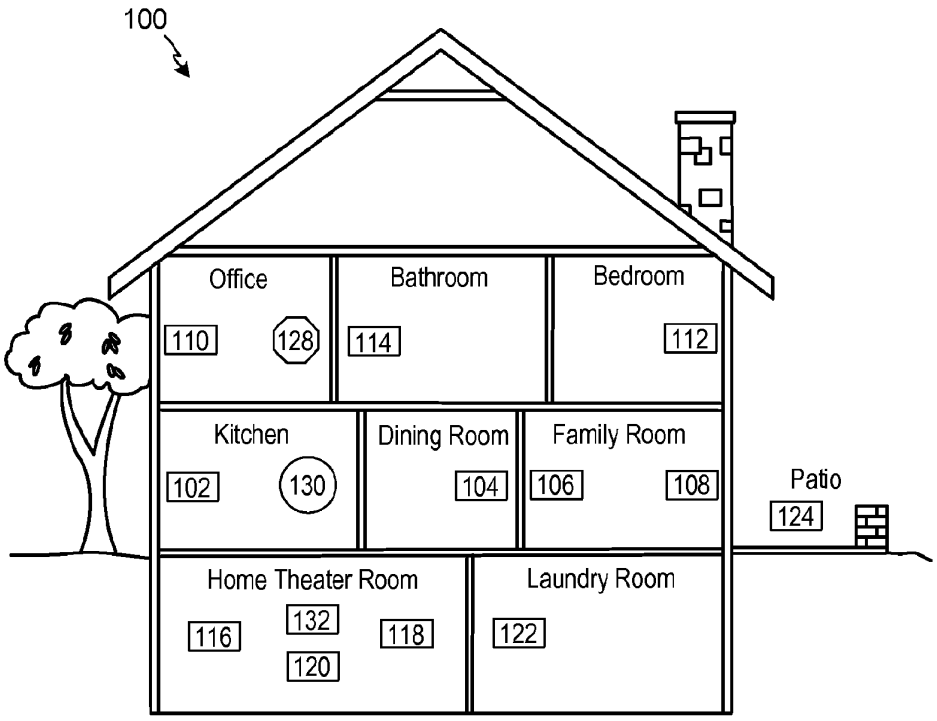

100
Office
110
128
Bathroom
114
Bedroom
112
Kitchen
102
130
Dining Room
104
Family Room
106
108
Patio
124
Home Theater Room
116
132
120
118
Laundry Room
122

FIGURE 1

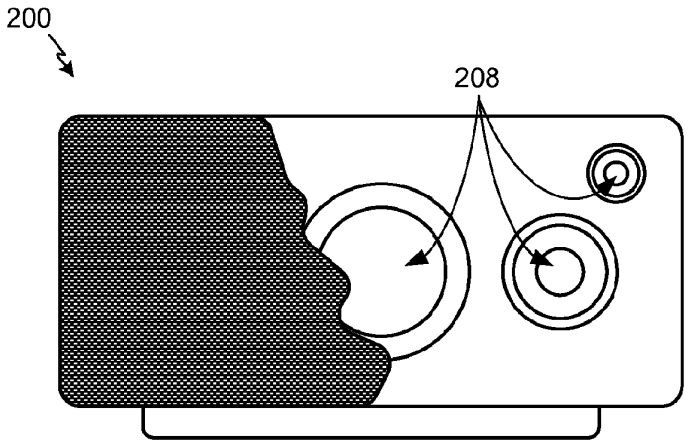



FIGURE 2A

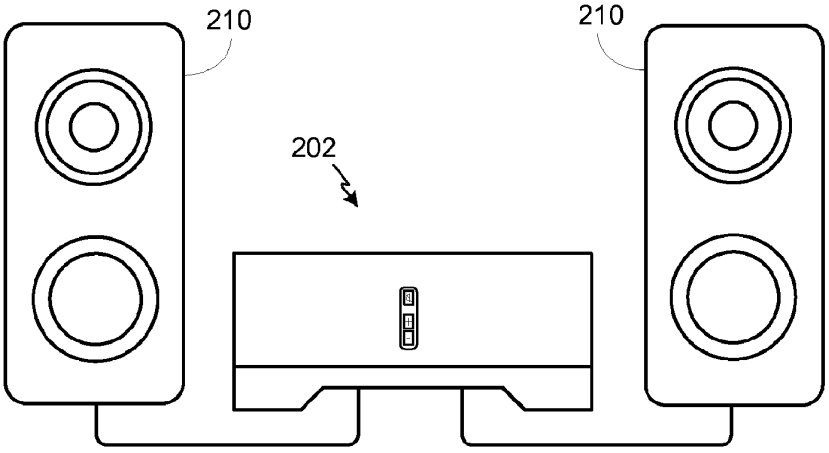



FIGURE 2B

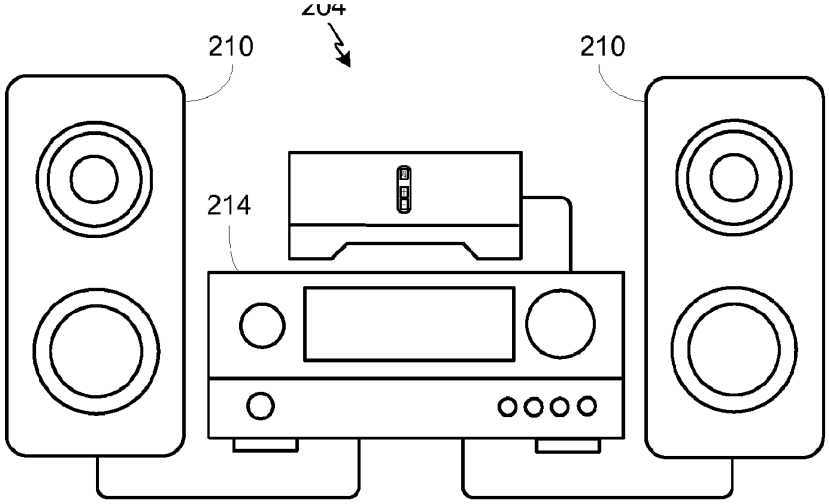



FIGURE 2C

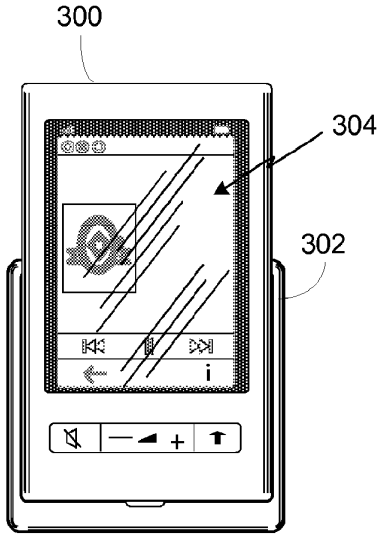



FIGURE 3

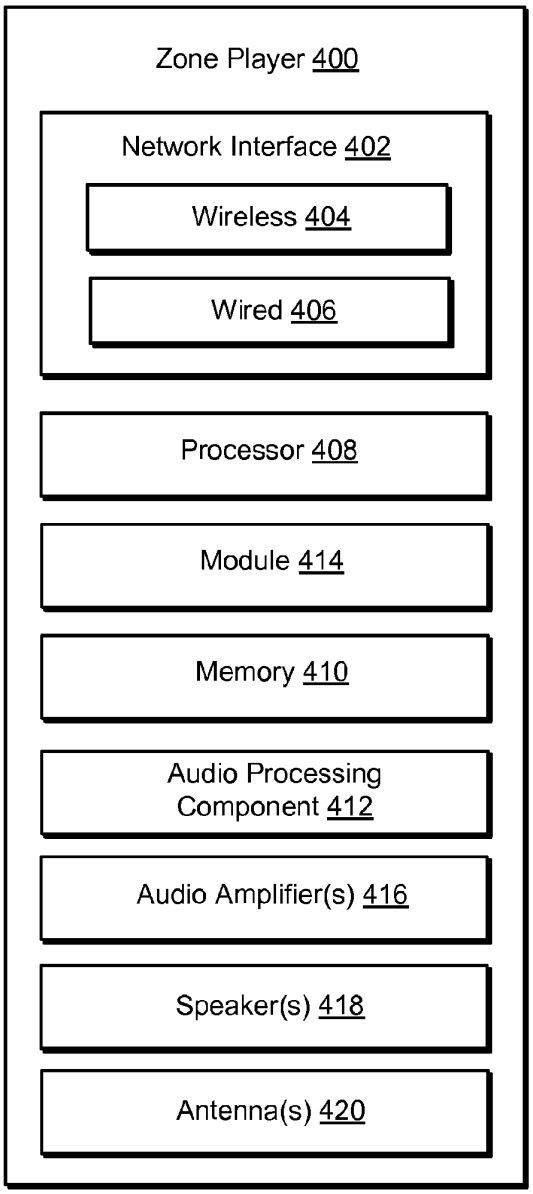

Zone Player 400
Network Interface 402
Wireless 404
Wired 406
Processor 408
Module 414
Memory 410
Audio Processing Component 412
Audio Amplifier(s) 416
Speaker(s) 418
Antenna(s) 420

FIGURE 4

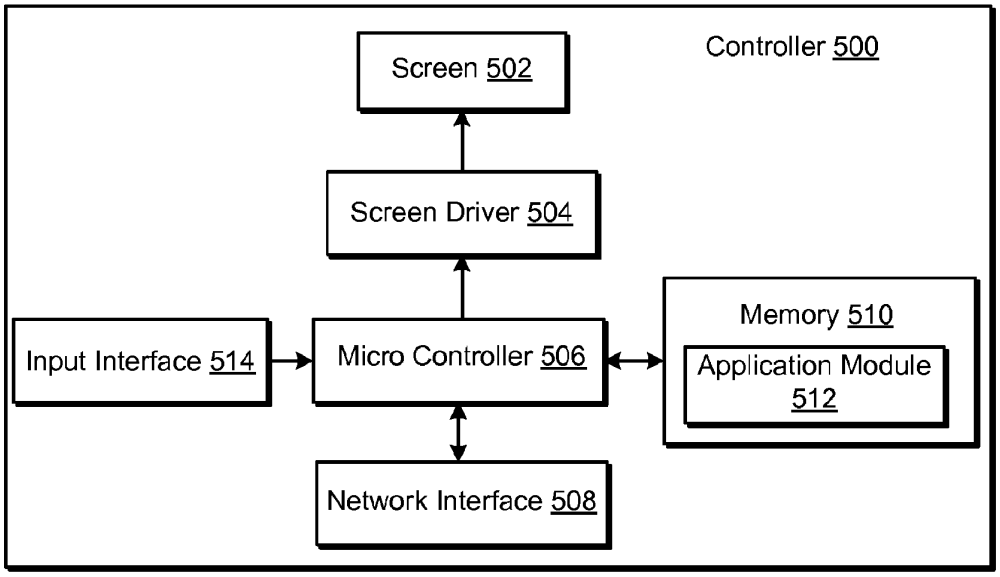

Controller 500
Screen 502
Screen Driver 504
Input Interface 514
Micro Controller 506
Memory 510
Application Module 512
Network Interface 508

FIGURE 5

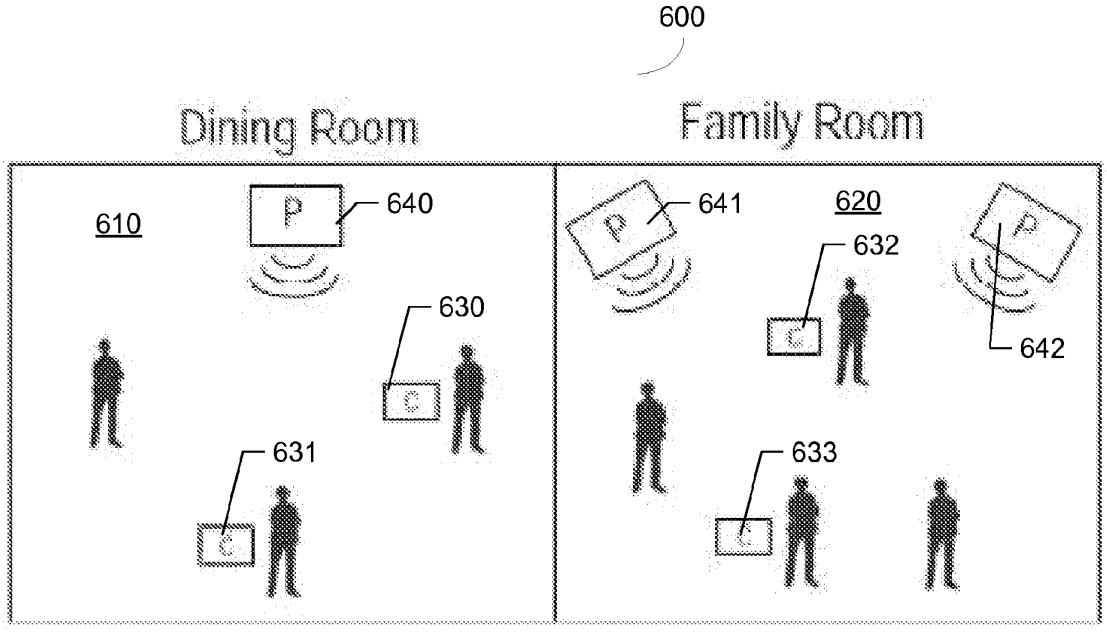

600
Dining Room
Family Room
610
P
640
630
631
641
620
632
642
633

FIGURE 6

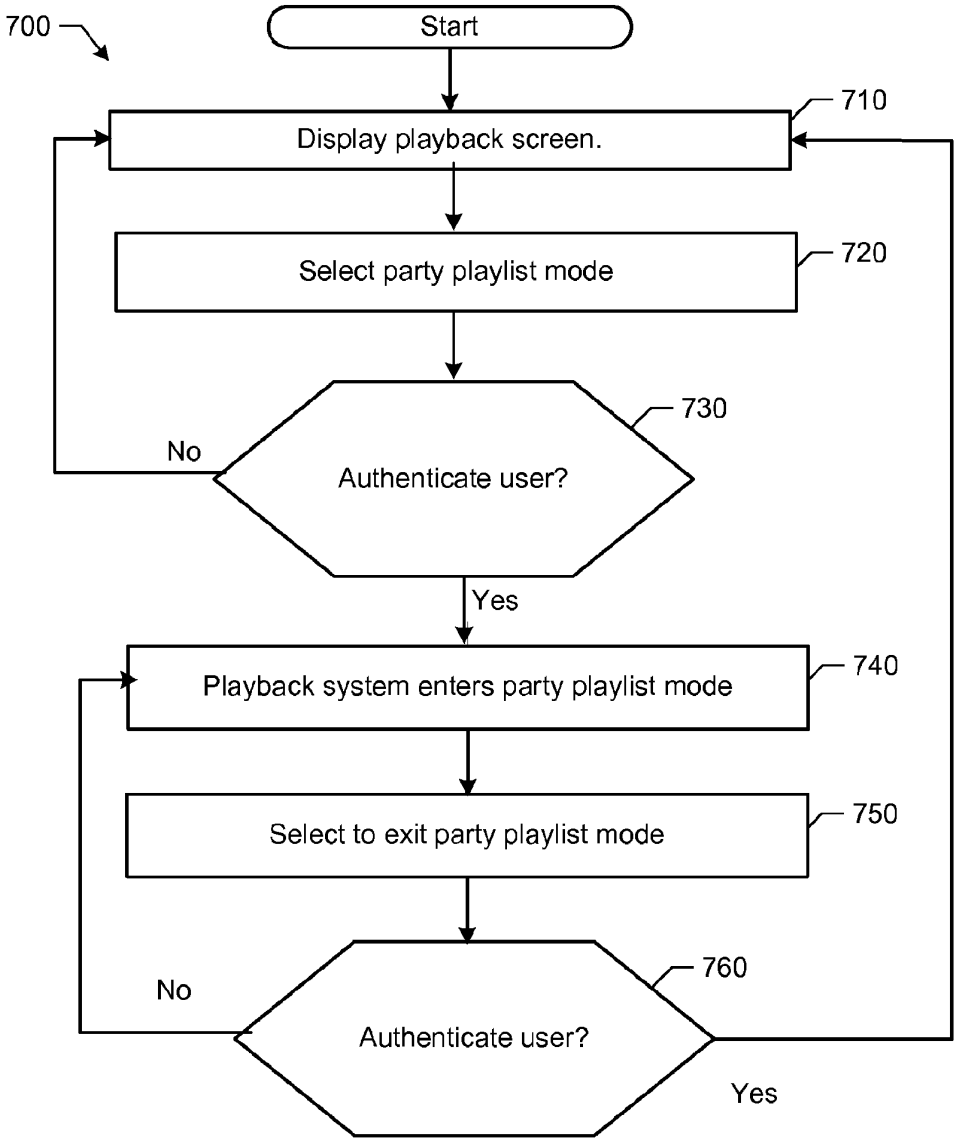

700
Start
710
Display playback screen.
720
Select party playlist mode
730
No
Authenticate user?
Yes
740
Playback system enters party playlist mode
750
Select to exit party playlist mode
760
No
Authenticate user?
Yes

FIGURE 7

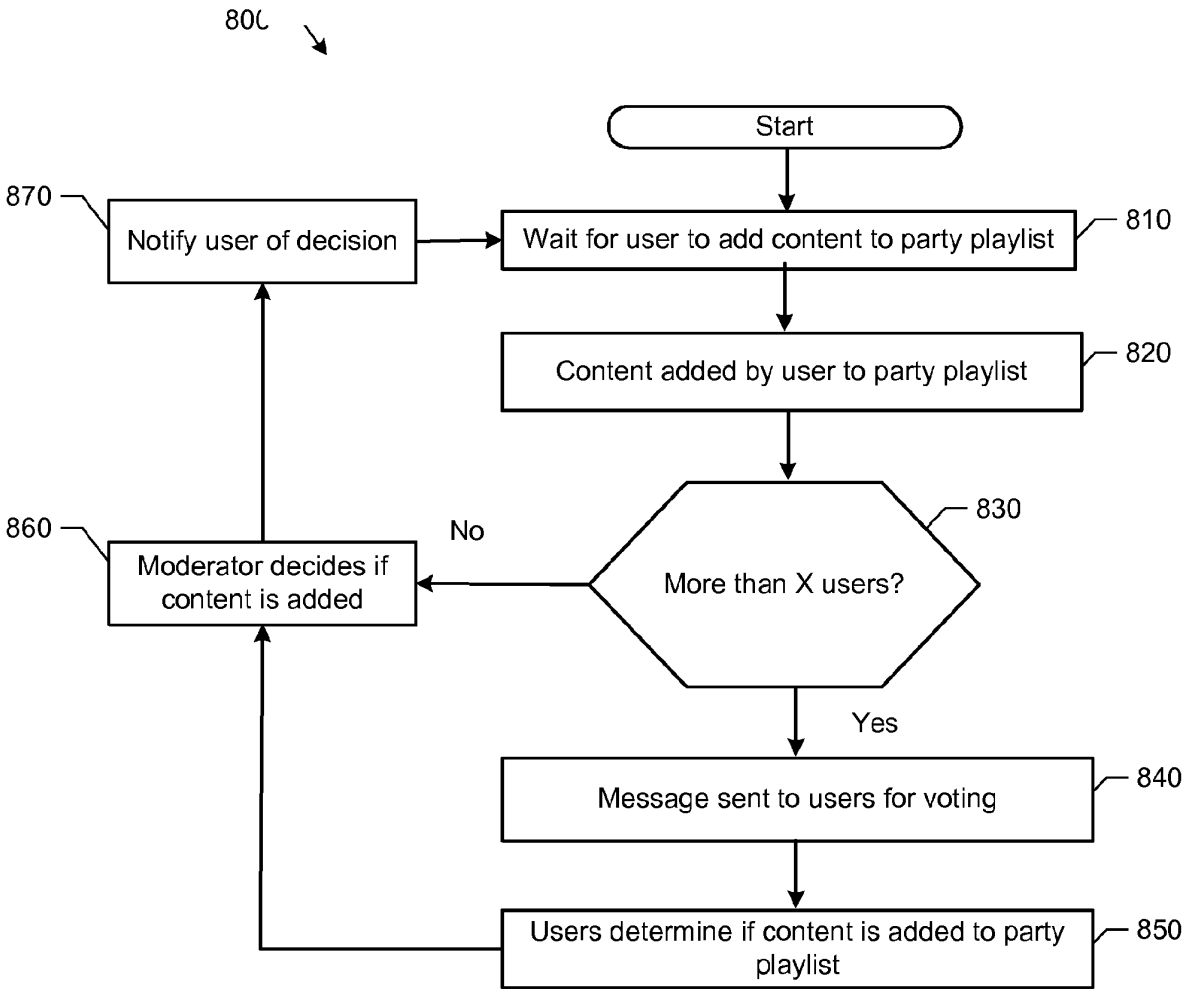

800
Start
870
Notify user of decision
Wait for user to add content to party playlist
810
Content added by user to party playlist
820
830
860
No
Moderator decides if content is added
More than X users?
Yes
Message sent to users for voting
840
Users determine if content is added to party playlist
850

FIGURE 8

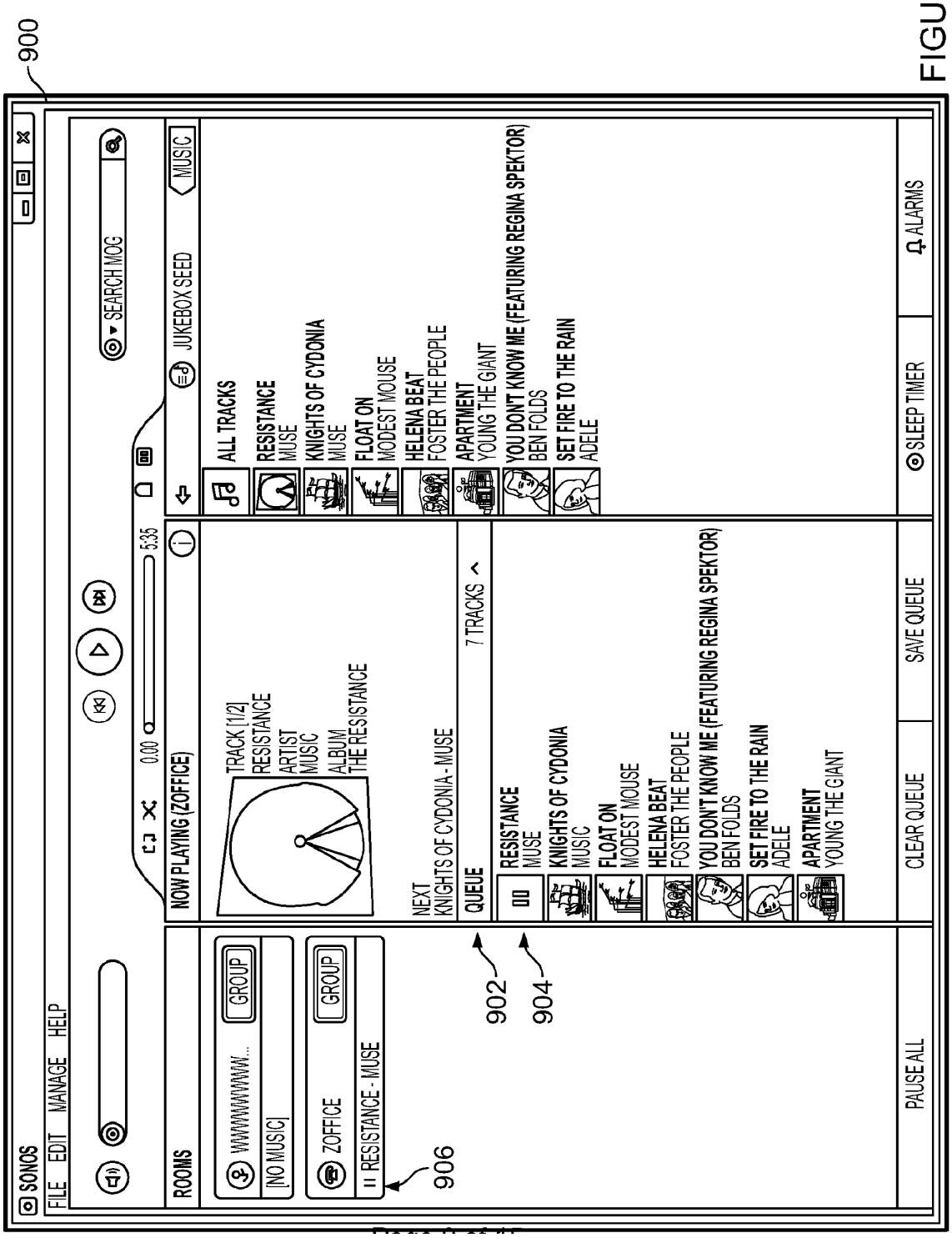

900
SONOS
FILE EDIT MANAGE HELP
SEARCH MOG
ROOMS
NOW PLAYING (ZOFFICE)
JUKEBOX SEED
MUSIC
ALL TRACKS
RESISTANCE
MUSE
KNIGHTS OF CYDONIA
MUSE
FLOAT ON
MODEST MOUSE
HELENA BEAT
FOSTER THE PEOPLE
APARTMENT
YOUNG THE GIANT
YOU DON'T KNOW ME (FEATURING REGINA SPEKTOR)
BEN FOLDS
SET FIRE TO THE RAIN
ADELE
WWWWWWWWW...
GROUP
[NO MUSIC]
ZOFFICE
GROUP
RESISTANCE - MUSE
906
TRACK [1/2]
RESISTANCE
ARTIST
MUSIC
ALBUM
THE RESISTANCE
NEXT
KNIGHTS OF CYDONIA - MUSE
QUEUE
7 TRACKS
902
904
RESISTANCE
MUSE
KNIGHTS OF CYDONIA
MUSIC
FLOAT ON
MODEST MOUSE
HELENA BEAT
FOSTER THE PEOPLE
YOU DON'T KNOW ME (FEATURING REGINA SPEKTOR)
BEN FOLDS
SET FIRE TO THE RAIN
ADELE
APARTMENT
YOUNG THE GIANT
PAUSE ALL
CLEAR QUEUE
SAVE QUEUE
SLEEP TIMER
ALARMS

FIGURE 9

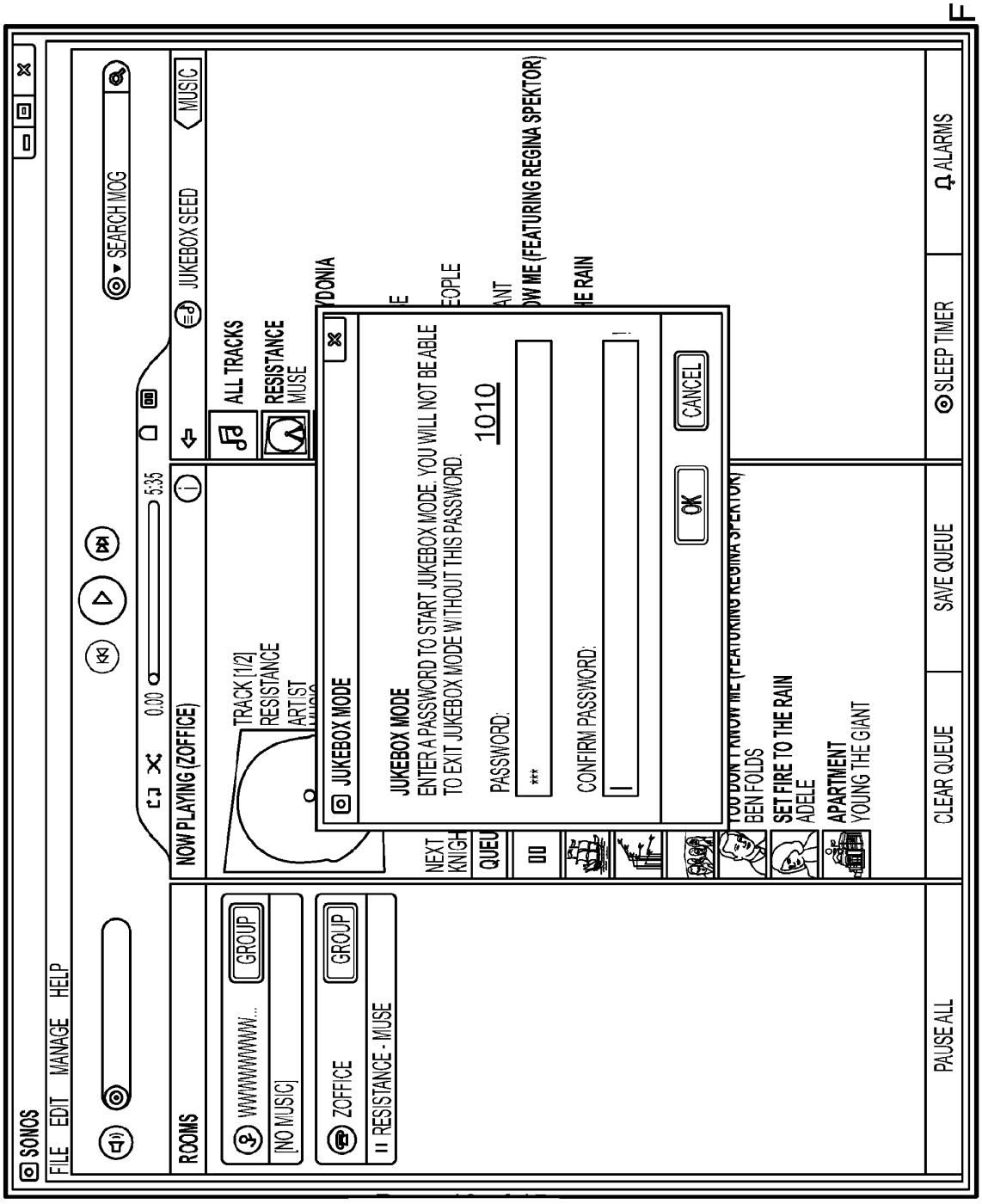

SONOS
FILE EDIT MANAGE HELP
SEARCH MOG
ROOMS
NOW PLAYING (ZOFFICE)
JUKEBOX SEED
MUSIC
ALL TRACKS
RESISTANCE
MUSE
TRACK (1/2)
RESISTANCE
ARTIST
JUKEBOX MODE
JUKEBOX MODE
ENTER A PASSWORD TO START JUKEBOX MODE. YOU WILL NOT BE ABLE TO EXIT JUKEBOX MODE WITHOUT THIS PASSWORD.
1010
PASSWORD:
***
CONFIRM PASSWORD:
OK
CANCEL
GROUP
[NO MUSIC]
ZOFFICE
RESISTANCE - MUSE
BEN FOLDS
SET FIRE TO THE RAIN
ADELE
APARTMENT
YOUNG THE GIANT
PAUSE ALL
CLEAR QUEUE
SAVE QUEUE
SLEEP TIMER
ALARMS

FIGURE 10

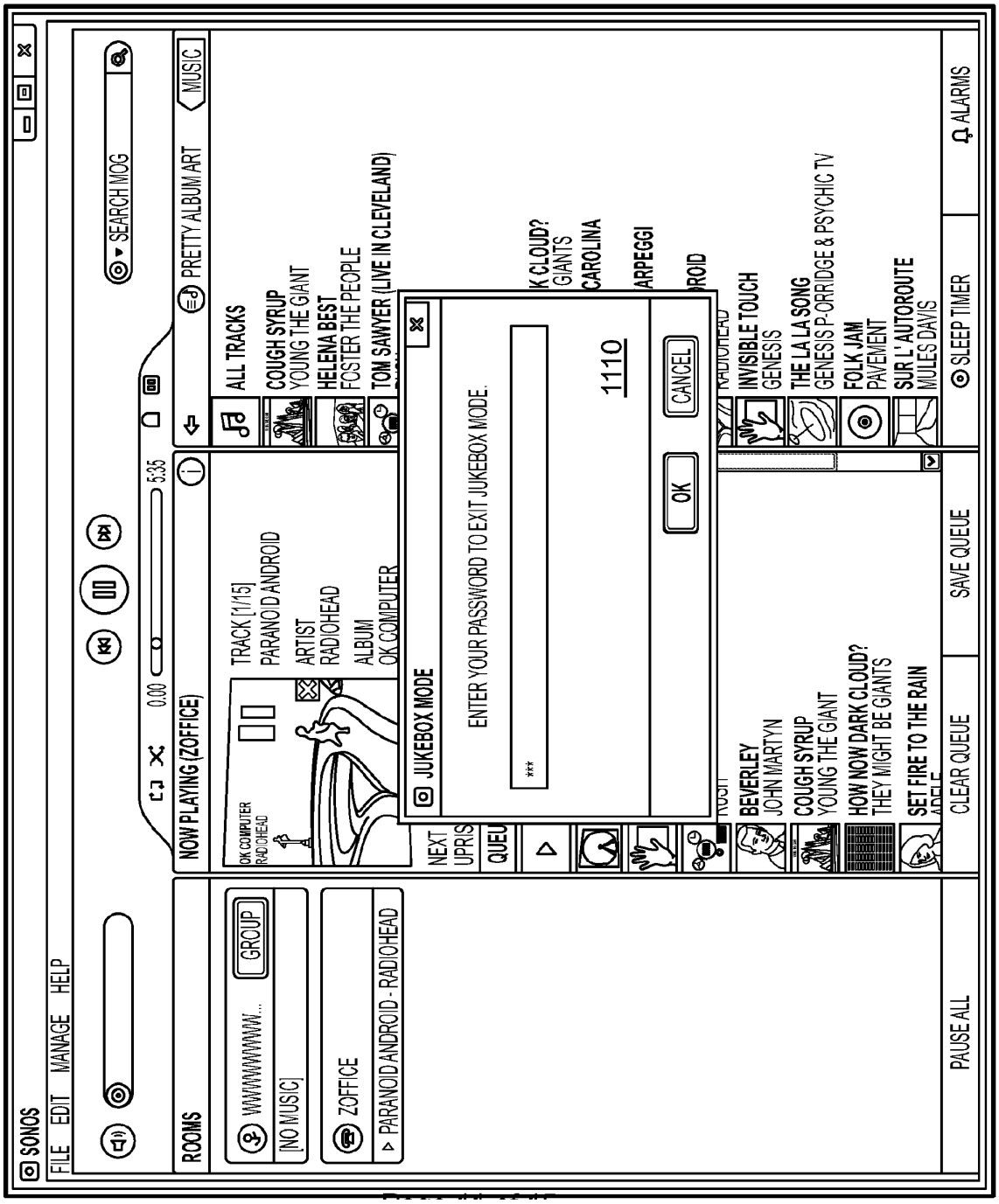

SONOS
FILE EDIT MANAGE HELP
SEARCH MOG
ROOMS
NOW PLAYING (ZOFFICE)
PRETTY ALBUM ART
MUSIC
ALL TRACKS
COUGH SYRUP
YOUNG THE GIANT
HELENA BEST
FOSTER THE PEOPLE
TOM SAWYER (LIVE IN CLEVELAND)
TRACK [1/15]
PARANOID ANDROID
ARTIST
RADIOHEAD
ALBUM
OK COMPUTER
JUKEBOX MODE
ENTER YOUR PASSWORD TO EXIT JUKEBOX MODE.
***
1110
OK
CANCEL
BEVERLEY
JOHN MARTYN
COUGH SYRUP
YOUNG THE GIANT
HOW NOW DARK CLOUD?
THEY MIGHT BE GIANTS
SET FIRE TO THE RAIN
INVISIBLE TOUCH
GENESIS
THE LA LA SONG
GENESIS P-ORRIDGE & PSYCHIC TV
FOLK JAM
PAVEMENT
SUR L' AUTOROUTE
MULES DAVIS
PAUSE ALL
CLEAR QUEUE
SAVE QUEUE
SLEEP TIMER
ALARMS
GROUP
[NO MUSIC]
ZOFFICE
PARANOID ANDROID - RADIOHEAD

FIGURE 11

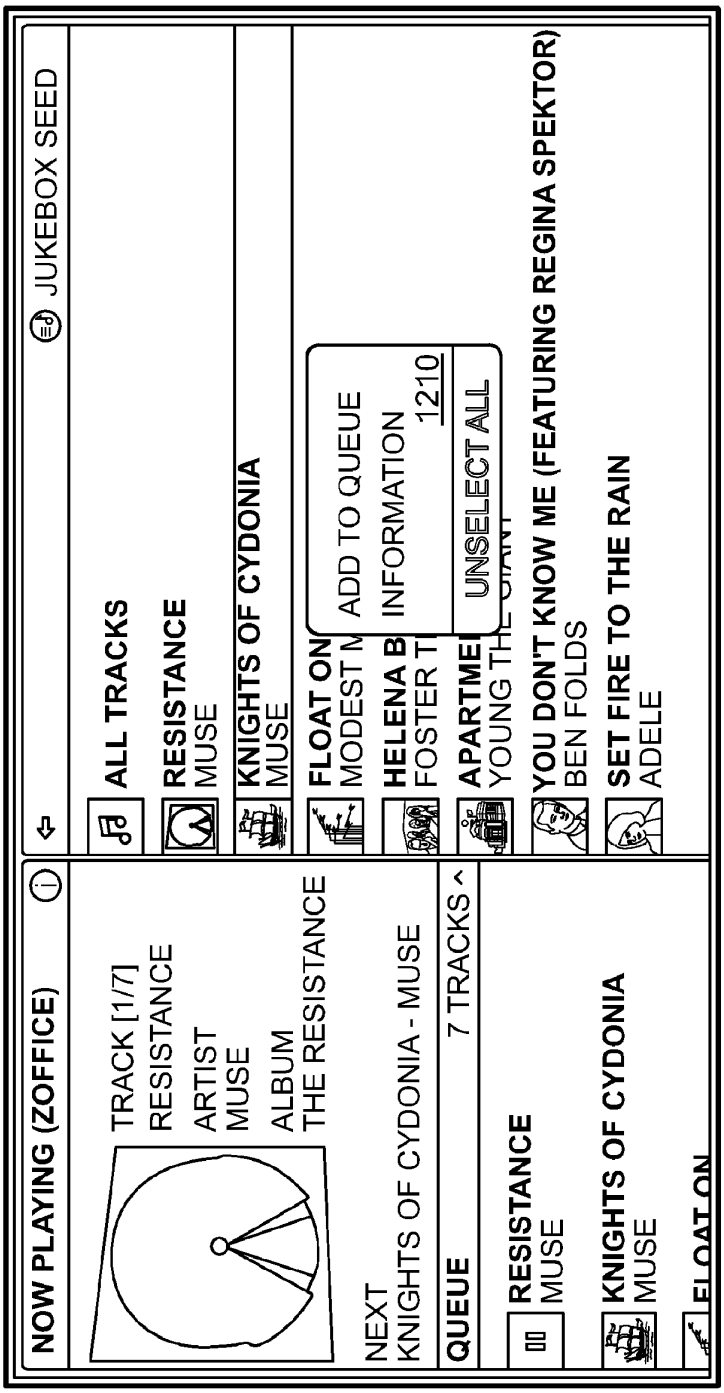

NOW PLAYING (ZOFFICE)
TRACK [1/7]
RESISTANCE
ARTIST
MUSE
ALBUM
THE RESISTANCE
NEXT
KNIGHTS OF CYDONIA - MUSE
QUEUE
7 TRACKS
RESISTANCE
MUSE
KNIGHTS OF CYDONIA
MUSE
JUKEBOX SEED
ALL TRACKS
RESISTANCE
MUSE
KNIGHTS OF CYDONIA
MUSE
FLOAT ON
MODEST M
HELENA B
FOSTER T
APARTME
YOUNG TH
YOU DON'T KNOW ME (FEATURING REGINA SPEKTOR)
BEN FOLDS
SET FIRE TO THE RAIN
ADELE
ADD TO QUEUE
INFORMATION
1210
UNSELECT ALL

FIGURE 12

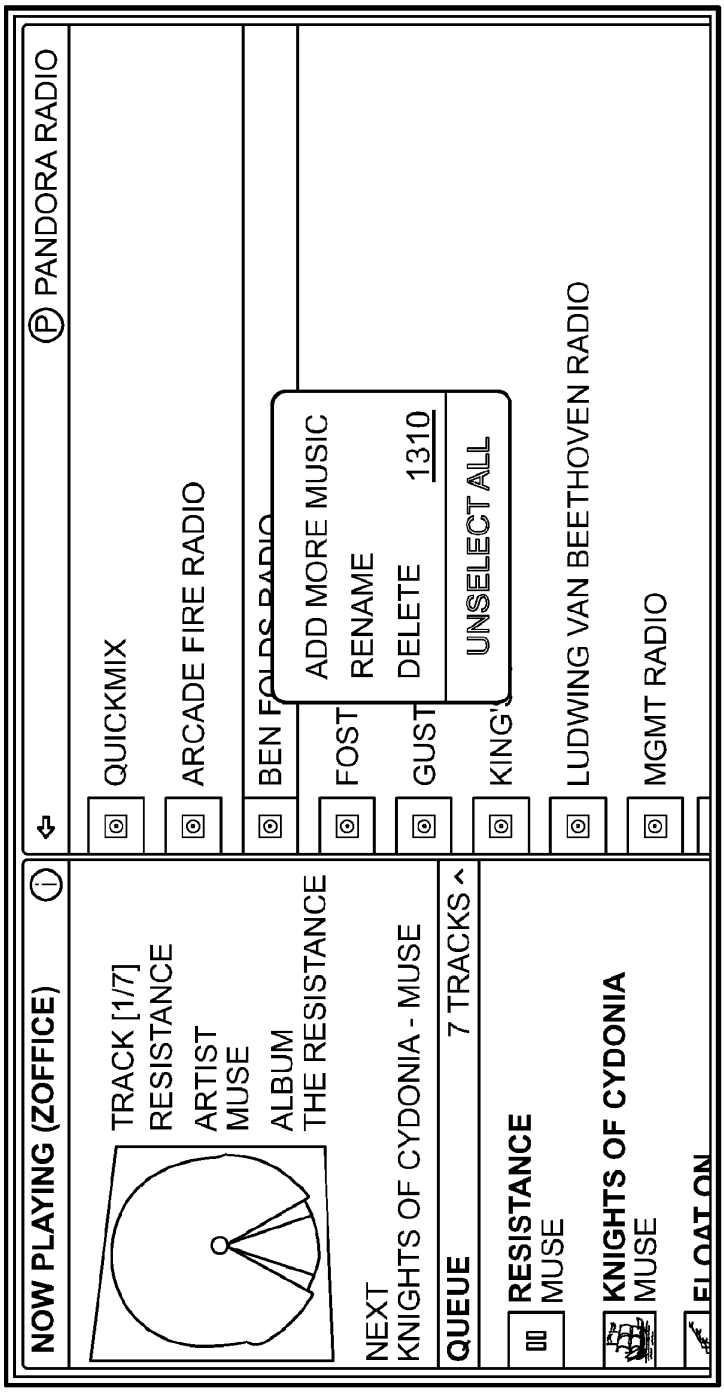

NOW PLAYING (ZOFFICE)
TRACK [1/7]
RESISTANCE
ARTIST
MUSE
ALBUM
THE RESISTANCE
NEXT
KNIGHTS OF CYDONIA - MUSE
QUEUE
7 TRACKS
RESISTANCE
MUSE
KNIGHTS OF CYDONIA
MUSE
PANDORA RADIO
QUICKMIX
ARCADE FIRE RADIO
BEN FOLDS RADIO
FOST
GUST
KING'S
LUDWING VAN BEETHOVEN RADIO
MGMT RADIO
ADD MORE MUSIC
RENAME
DELETE
1310
UNSELECT ALL

FIGURE 13

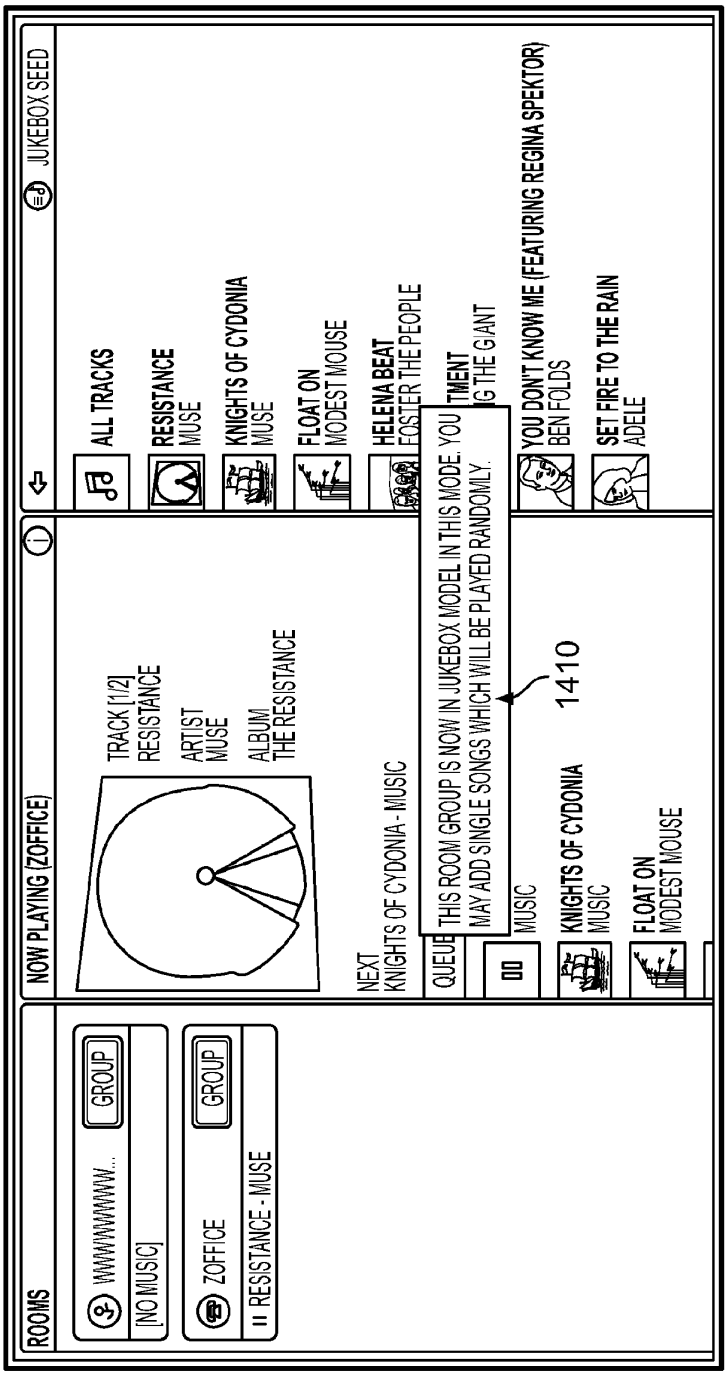

ROOMS
NOW PLAYING (ZOFFICE)
JUKEBOX SEED
WWWWWWWWW...
GROUP
[NO MUSIC]
ZOFFICE
GROUP
RESISTANCE - MUSE
TRACK [1/2]
RESISTANCE
ARTIST
MUSE
ALBUM
THE RESISTANCE
NEXT
KNIGHTS OF CYDONIA - MUSIC
QUEUE
THIS ROOM GROUP IS NOW IN JUKEBOX MODEL IN THIS MODE. YOU
MAY ADD SINGLE SONGS WHICH WILL BE PLAYED RANDOMLY.
MUSIC
KNIGHTS OF CYDONIA
MUSIC
FLOAT ON
MODEST MOUSE
1410
ALL TRACKS
RESISTANCE
MUSE
KNIGHTS OF CYDONIA
MUSE
FLOAT ON
MODEST MOUSE
HELENA BEAT
FOSTER THE PEOPLE
TMENT
G THE GIANT
YOU DON'T KNOW ME (FEATURING REGINA SPEKTOR)
BEN FOLDS
SET FIRE TO THE RAIN
ADELE

FIGURE 14

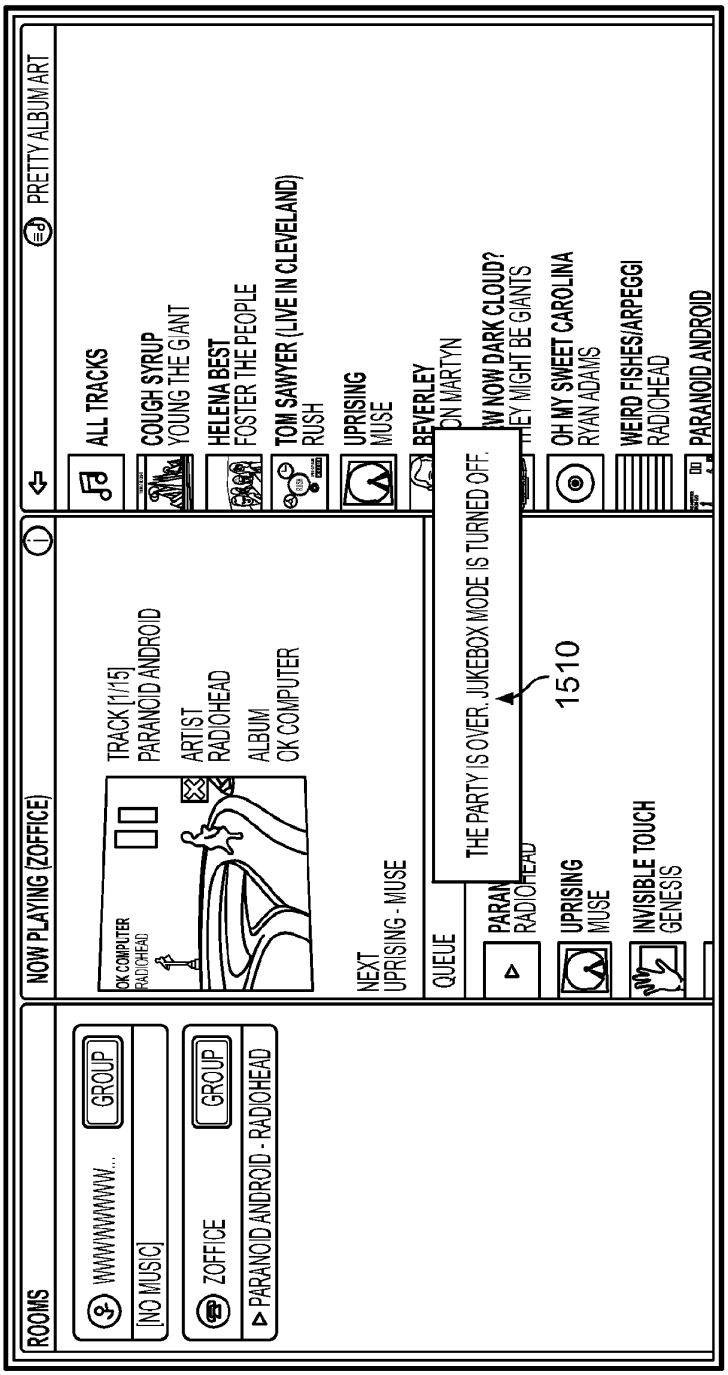

ROOMS
NOW PLAYING (ZOFFICE)
PRETTY ALBUM ART
GROUP
[NO MUSIC]
GROUP
ZOFFICE
PARANOID ANDROID - RADIOHEAD
OK COMPUTER
RADIOHEAD
TRACK [1/15]
PARANOID ANDROID
ARTIST
RADIOHEAD
ALBUM
OK COMPUTER
NEXT
UPRISING - MUSE
QUEUE
THE PARTY IS OVER. JUKEBOX MODE IS TURNED OFF.
1510
PARAN
RADIOHEAD
UPRISING
MUSE
INVISIBLE TOUCH
GENESIS
ALL TRACKS
COUGH SYRUP
YOUNG THE GIANT
HELENA BEST
FOSTER THE PEOPLE
TOM SAWYER (LIVE IN CLEVELAND)
RUSH
UPRISING
MUSE
BEVERLEY
ON MARTYN
W NOW DARK CLOUD?
EY MIGHT BE GIANTS
OH MY SWEET CAROLINA
RYAN ADAMS
WEIRD FISHES/ARPEGGI
RADIOHEAD
PARANOID ANDROID

FIGURE 15

INTERNATIONAL SEARCH REPORT

International application No.
**PCT/US2013/046386**

**A. CLASSIFICATION OF SUBJECT MATTER**

**G06Q 50/10(2012.01)i**

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)
G06Q 50/10; G06F 15/16; H04N 7/173; G06F 7/00; G06F 17/30; H04L 9/00; H04W 40/00

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched
Korean utility models and applications for utility models
Japanese utility models and applications for utility models

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)
eKOMPASS(KIPO internal) & Keywords:playlist, authorization, participate, zone:

**C. DOCUMENTS CONSIDERED TO BE RELEVANT**

| Category* | Citation of document, with indication, where appropriate, of the relevant passages | Relevant to claim No. |
|---|---|---|
| Y | US 7483958 B1 (TAREK Z. ELABBADY et al.) 27 January 2009<br>See abstract, column 7, lines 61-66, column 11, lines 1-20, claims 1, 6 and figure 4. | 1-21 |
| Y | US 2010-0228740 A1 (ALAN CANNISTRARO et al.) 09 September 2010<br>See abstract, paragraphs [0009], [0036]-[0037], [0047]-[0057], [0089], claim 1 and figure 4. | 1-21 |
| A | US 2012-0129446 A1 (STEVE KO et al.) 24 May 2012<br>See abstract, paragraphs [0036]-[0037], claim 1 and figure 4. | 1-21 |
| A | US 2009-0031336 A1 (TIMOTHY R. CHAVEZ et al.) 29 January 2009<br>See abstract, paragraph [0021], claim 1 and figure 3. | 1-21 |
| A | US 2007-0299778 A1 (RYAN A. HAVESON et al.) 27 December 2007<br>See abstract, claim 1 and figure 3. | 1-21 |

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

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

| Date of the actual completion of the international search | Date of mailing of the international search report |
|---|---|
| 27 September 2013 (27.09.2013) | **30 September 2013 (30.09.2013)** |
| Name and mailing address of the ISA/KR<br>Korean Intellectual Property Office<br>189 Cheongsa-ro, Seo-gu, Daejeon Metropolitan City, 302-701, Republic of Korea<br>Facsimile No. +82-42-472-7140 | Authorized officer<br>KIM Sung Gon<br>Telephone No. +82-42-481-8746 |

Form PCT/ISA/210 (second sheet) (July 2009)

**INTERNATIONAL SEARCH REPORT**
Information on patent family members

International application No.
**PCT/US2013/046386**

| Patent document cited in search report | Publication date | Patent family member(s) | Publication date |
|---|---|---|---|
| US 7483958 B1 | 27/01/2009 | None | |
| US 2010-0228740 A1 | 09/09/2010 | None | |
| US 2012-0129446 A1 | 24/05/2012 | AT 520238 T | 15/08/2011 |
| | | CN 101346965 A | 14/01/2009 |
| | | CN 102984041 A | 20/03/2013 |
| | | EP 1964365 A1 | 03/09/2008 |
| | | EP 1964365 B1 | 10/08/2011 |
| | | EP 2299654 A1 | 23/03/2011 |
| | | HK 1122664 A1 | 18/11/2011 |
| | | JP 2009-521185 A | 28/05/2009 |
| | | JP 2012-235471 A | 29/11/2012 |
| | | US 2007-169115 A1 | 19/07/2007 |
| | | US 2010-049835 A1 | 25/02/2010 |
| | | US 2013-080599 A1 | 28/03/2013 |
| | | US 7702279 B2 | 20/04/2010 |
| | | US 8112032 B2 | 07/02/2012 |
| | | US 8315555 B2 | 20/11/2012 |
| | | WO 2007-075376 A1 | 05/07/2007 |
| US 2009-0031336 A1 | 29/01/2009 | None | |
| US 2007-0299778 A1 | 27/12/2007 | None | |

Form PCT/ISA/210 (patent family annex) (July 2009)

| Electronic Acknowledgement Receipt | |
|---|---|
| **EFS ID:** | 25842330 |
| **Application Number:** | 13864248 |
| **International Application Number:** | |
| **Confirmation Number:** | 5095 |
| **Title of Invention:** | SYSTEM AND METHOD FOR SYNCHRONIZING OPERATIONS AMONG A PLURALITY OF INDEPENDENTLY CLOCKED DIGITAL DATA PROCESSING DEVICES |
| **First Named Inventor/Applicant Name:** | Nicholas A. J. Millington |
| **Customer Number:** | 107361 |
| **Filer:** | Benjamin Michael Urban |
| **Filer Authorized By:** | |
| **Attorney Docket Number:** | 13-0401 (MBHB 15-517-CON) |
| **Receipt Date:** | 20-MAY-2016 |
| **Filing Date:** | 17-APR-2013 |
| **Time Stamp:** | 18:13:06 |
| **Application Type:** | Utility under 35 USC 111(a) |

## Payment information:

| Submitted with Payment | no |
|---|---|

## File Listing:

| Document Number | Document Description | File Name | File Size(Bytes)/ Message Digest | Multi Part /.zip | Pages (if appl.) |
|---|---|---|---|---|---|
| 1 | Information Disclosure Statement (IDS) Form (SB08) | 13-0401_MBHB15-517-CON_IDS.pdf | 1056038<br>6c56c1845fee8abd410fc208f214ec8afcc42f04 | no | 8 |
| **Warnings:** | | | | | |
| **Information:** | | | | | |

| | | | | | |
|---|---|---|---|---|---|
| 2 | Foreign Reference | JP2009535708.pdf | 1158271<br>a225780e8ab7472c0ae89ca2c32fd69881f5cea9 | no | 26 |
| **Warnings:** | | | | | |
| **Information:** | | | | | |
| 3 | Foreign Reference | WO2007127485A2.pdf | 1743497<br>51dbdbf632a2131bb27538bd84dc36132b5c830f | no | 32 |
| **Warnings:** | | | | | |
| **Information:** | | | | | |
| 4 | Foreign Reference | WO2007131555A1.pdf | 2374487<br>f1e473bd1adddf7fe9604ba6392202e2eef23bc3 | no | 49 |
| **Warnings:** | | | | | |
| **Information:** | | | | | |
| 5 | Foreign Reference | WO2014004182.pdf | 2037255<br>300230e07c41979daf09d809d507a13c449515a8 | no | 49 |
| **Warnings:** | | | | | |
| **Information:** | | | | | |
| 6 | Non Patent Literature | Canadian_No_2842342_Office_Action_4-4-16.pdf | 3685860<br>433fa1bfbfcfe662e98c18db0795f2ae1f34aaaf | no | 5 |
| **Warnings:** | | | | | |
| **Information:** | | | | | |
| 7 | Non Patent Literature | EP14181454_1_ExamReport_03-22-2016.pdf | 255952<br>2364ff8d1c445a54c1d67abbfd57a96639ece5a8 | no | 6 |
| **Warnings:** | | | | | |
| **Information:** | | | | | |
| 8 | Non Patent Literature | Falcone_Sonos_BU150.pdf | 626015<br>090725021e3e3fad9acd8897dd5f43cfce816b50 | no | 11 |
| **Warnings:** | | | | | |
| **Information:** | | | | | |
| 9 | Non Patent Literature | JP2015520288_OA_03-29-2016.pdf | 304956<br>5082659c564f8039e97018b78697d9b8277be286 | no | 12 |
| **Warnings:** | | | | | |
| **Information:** | | | | | |
| 10 | Non Patent Literature | 13848921_OA_03-08-2016.pdf | 466605<br>242b90a94e7520bccc2580d68b752eb8bbdb416f | no | 13 |
| **Warnings:** | | | | | |
| **Information:** | | | | | |

| | | | | | |
|---|---|---|---|---|---|
| 11 | Non Patent Literature | 13533105_NOA_04-07-2016.pdf | 1427429<br>2951fc59784e93854f6c934f80dbb8974d7701db | no | 40 |
| **Warnings:** | | | | | |
| **Information:** | | | | | |
| 12 | Non Patent Literature | 13864247_NOA_4-11-16.pdf | 850319<br>65391c07ba210127cdfe68cae1235959e07c31f0 | no | 21 |
| **Warnings:** | | | | | |
| **Information:** | | | | | |
| | | **Total Files Size (in bytes):** | 15986684 | | |

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**New Applications Under 35 U.S.C. 111**
**If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.**

**National Stage of an International Application under 35 U.S.C. 371**
**If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.**

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PTO/SB/08a (03-15)
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| Application Number | 13864248 |
| Filing Date | 2013-04-17 |
| First Named Inventor | NICHOLAS; A. J. Millington |
| Art Unit | 2442 |
| Examiner Name | SURVILLO, Oleg |
| Attorney Docket Number | 13-0401 (MBHB 15-517-CON) |

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| | Examiner Name | SURVILLO, Oleg |
| | Attorney Docket Number | 13-0401 (MBHB 15-517-CON) |

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| | Examiner Name | SURVILLO, Oleg |
| | Attorney Docket Number | 13-0401 (MBHB 15-517-CON) |

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| | Application Number | 13864248 |
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| | Examiner Name | SURVILLO, Oleg |
| | Attorney Docket Number | 13-0401 (MBHB 15-517-CON) |

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| | Art Unit | 2442 |
| | Examiner Name | SURVILLO, Oleg |
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Please see 37 CFR 1.97 and 1.98 to make the appropriate selection(s):

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| Signature | /Benjamin M. Urban/ | Date (YYYY-MM-DD) | 2016-03-18 |
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| Name/Print | Benjamin M. Urban | Registration Number | 71,591 |

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# Bibliographic data: JP2002111817 (A) — 2002-04-12

## SYSTEM AND METHOD FOR REPRODUCING SOUND OF PORTABLE TERMINAL

**Inventor(s):** KOMURA TATSUMI ± (KOMURA TATSUMI)

**Applicant(s):** NEC CORP ± (NEC CORP)

**Classification:** - international: ***H04M1/00; H04M1/02; H04M1/03; H04R5/02; H04S1/00;*** (IPC1-7): H04M1/00; H04M1/02; H04R5/02; H04S1/00
- cooperative: **H04M1/0202**; **H04M1/03**; **H04R1/025**; H04M1/0214; H04M1/0235; H04R2499/11; H04R2499/15; H04R5/02

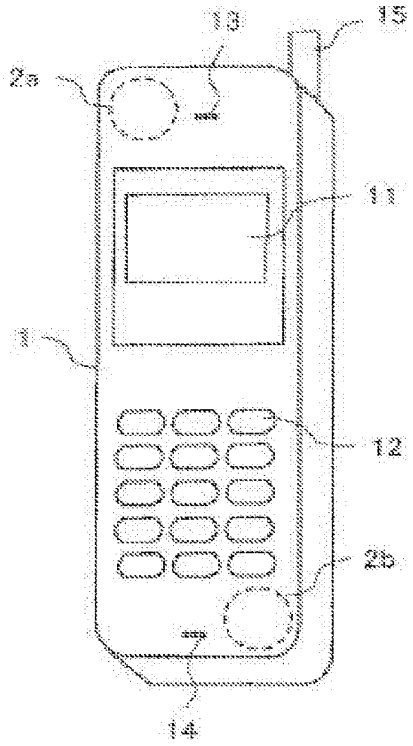
**Application number:** JP20000295030 20000927

**Priority number(s):** JP20000295030 20000927

**Also published as:** JP4716238 (B2) US2004023697 (A1) US7702320 (B2) WO0228064 (A1)

**Abstract of JP2002111817 (A)**

PROBLEM TO BE SOLVED: To provide a portable terminal which can reproduce a high quality sound comfortably while exhibiting high adaptability to working environment and high convenience. SOLUTION: In the sound reproduction system of a portable terminal 1, the portable terminal is provided with at least two sound speakers 2a and 2b being driven simultaneously to supplement the reproduction sound mutually.


13
15
2a
11
1
12
2b
14

(19)日本国特許庁（ＪＰ）　(12) **公開特許公報**（Ａ）　(11)特許出願公開番号
特開2002－111817
（P2002－111817A）
(43)公開日　平成14年４月12日(2002.4.12)

| (51)Int.Cl.[7] | 識別記号 | ＦＩ | | テーマコード（参考） |
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| Ｈ０４Ｍ　1/02 | | Ｈ０４Ｍ　1/02 | Ｃ | ５Ｄ０１１ |
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| Ｈ０４Ｓ　1/00 | | Ｈ０４Ｓ　1/00 | Ａ | |

審査請求　未請求　請求項の数35　ＯＬ　（全 21 頁）　最終頁に続く

(21)出願番号　特願2000－295030(P2000－295030)

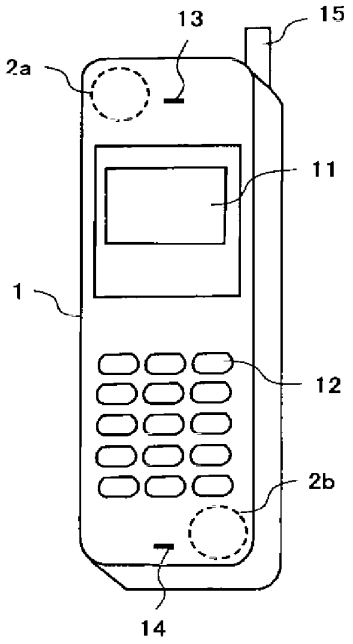
(22)出願日　平成12年９月27日(2000.9.27)

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最終頁に続く

(54)【発明の名称】　携帯端末装置の音響再生システム及び方法

(57)【要約】
【課題】快適、高音質な音響再生が可能で、使用環境への高適応性、高利便性を有する携帯端末装置を提供する。
【解決手段】　携帯端末装置１の音響再生システムにおいて、携帯端末装置に少なくとも２つの音響用スピーカ２ａ、２ｂが設けられ、前記少なくとも２つの音響用スピーカは、同時に駆動され、互いの再生音響を補助し合う。



【特許請求の範囲】
【請求項１】　携帯端末装置の音響再生システムにおいて、
携帯端末装置に少なくとも２つの音響用スピーカが設けられ、
前記少なくとも２つの音響用スピーカは、同時に駆動され、互いの再生音響を補助し合うことを特徴とする携帯端末装置の音響再生システム。
【請求項２】　前記少なくとも２つの音響用スピーカは、前記携帯端末装置の長手方向又は対角線の両端に配置されることを特徴とする、請求項１に記載の携帯端末装置の音響再生システム。
【請求項３】　前記少なくとも２つの音響用スピーカのうち少なくとも一方の音響用スピーカは、前記携帯端末装置の筐体壁と角度をもって設置されることを特徴とする、請求項１に記載の携帯端末装置の音響再生システム。
【請求項４】　前記少なくとも２つの音響用スピーカのうち少なくとも一方の音響用スピーカと前記携帯端末装置の筐体壁との角度が自由に変更できることを特徴とする、請求項１に記載の携帯端末装置の音響再生システム。
【請求項５】　前記少なくとも２つの音響用スピーカは、互いの角度が自由に変更されることを特徴とする、請求項１に記載の携帯端末装置の音響再生システム。
【請求項６】　前記少なくとも２つの音響用スピーカの間にクロストーク防止壁を設け、前記クロストーク防止壁は、個々の音響用スピーカから発生するクロストークを防ぐことを特徴とする、請求項１に記載の携帯端末装置の音響再生システム。
【請求項７】　前記クロストーク防止壁は折り畳み又は取り外し可能であることを特徴とする、請求項６に記載の携帯端末装置の音響再生システム。
【請求項８】　前記携帯端末装置にクロストーク削除の信号処理回路を設け、前記クロストーク削除の信号処理回路は、前記少なくとも２つの音響用スピーカの入力信号を処理してクロストークを削除することを特徴とする、請求項１に記載の携帯端末装置の音響再生システム。
【請求項９】　前記少なくとも２つの音響用スピーカのうち少なくとも一方は携帯端末装置の筐体壁位置より凹んだ位置に設置されることを特徴とする、請求項１に記載の携帯端末装置の音響再生システム。
【請求項１０】　前記少なくとも一方の音響用スピーカの一部又は全てを前記携帯端末装置の筐体壁の多孔部で覆うか又は前記スピーカの振動面を覆う筐体壁を削除することを特徴とする、請求項９に記載の携帯端末装置の音響再生システム。
【請求項１１】　前記少なくとも２つの音響用スピーカのうち少なくとも一方の音響用スピーカは、前記携帯端末装置の両端の側面からはみ出して設置されることを特徴とする、請求項１に記載の携帯端末装置の音響再生システム。
【請求項１２】　前記少なくとも一方の音響用スピーカは前記携帯端末装置の前面から奥の方に位置し、前記少なくとも一方の音響スピーカの一部を前記携帯端末装置の筐体壁の多孔部で覆うか又は前記少なくとも一方の音響用スピーカの振動面を覆う筐体壁を削除することを特徴とする、請求項１１に記載の携帯端末装置の音響再生システム。
【請求項１３】　はみ出した前記少なくとも一方の音響用スピーカが前記携帯端末装置内に収納されることを特徴とする、請求項１１に記載の携帯端末装置の音響再生システム。
【請求項１４】　前記少なくとも２つの音響用スピーカは前記携帯端末装置に一列のスピーカアレイに配列されることを特徴とする、請求項１に記載の携帯端末装置の音響再生システム。
【請求項１５】　前記少なくとも２つの音響用スピーカは互いに異なる方向に向けて前記携帯端末装置に配列されることを特徴とする、請求項１に記載の携帯端末装置の音響再生システム。
【請求項１６】　前記少なくとも２つの音響用スピーカは異なる方向に個々に異なる音響が聴取されるように音響再生を行うことを特徴とする、請求項１５に記載の携帯端末装置の音響再生システム。
【請求項１７】　前記携帯端末装置に指向性の絞り信号処理回路が設けられ、前記指向性の絞り信号処理回路は、前記少なくとも２つの音響用スピーカの入力信号を処理して指向性の方向を絞ることを特徴とする、請求項１に記載の携帯端末装置の音響再生システム。
【請求項１８】　前記携帯端末装置に無指向性信号処理回路を設け、前記無指向性信号処理回路は前記少なくとも２つの音響用スピーカの入力信号を処理して無指向性にすることを特徴とする、請求項１に記載の携帯端末装置の音響再生システム。
【請求項１９】　前記携帯端末装置に前記少なくとも２つの音響用スピーカの指向性に関する方向を絞る指向性の絞り信号処理回路と、前記少なくとも２つの音響用スピーカを無指向性にする無指向性信号処理回路とを設け、前記指向性の絞り信号処理回路、前記無指向性信号処理回路が択一的に選択されることを特徴とする、請求項１に記載の携帯端末装置の音響再生システム。
【請求項２０】　高効率な前記少なくとも２つの音響用スピーカを用い、音響再生時にアンプレスの駆動を可能にすることを特徴とする、請求項１に記載の携帯端末装置の音響再生システム。
【請求項２１】　前記少なくとも２つの音響用スピーカから個々の音響を再生し、個々の音響の音量を独自に調整可能にすることを特徴とする、請求項１に記載の携帯

端末装置の音響再生システム。
【請求項２２】　前記少なくとも２つの音響用スピーカは、中音～高音域に特化した特性、低音域に特化した特性をそれぞれ有することを特徴とする、請求項１に記載の携帯端末装置の音響再生システム。
【請求項２３】　前記少なくとも２つの音響用スピーカのうち少なくとも一方は、前記携帯端末装置が机、床、壁際を含む面に接して設置された際に、音響の反射が利用できるようにすることを特徴とする、請求項１に記載の携帯端末装置の音響再生システム。
【請求項２４】　前記少なくとも２つの音響用スピーカのうち少なくとも一方の音響再生と前記携帯端末装置の通話を同時に可能にすることを特徴とする、請求項１に記載の携帯端末装置の音響再生システム。
【請求項２５】　前記少なくとも一方の音響用スピーカの音響再生信号が前記携帯端末装置の通話相手にも聴取可能なように送信されることを特徴とする、請求項１に記載の携帯端末装置の音響再生システム。
【請求項２６】　前記少なくとも２つの音響用スピーカの少なくとも１つは、通話マイクロフォン兼用の音響用スピーカ、受話スピーカ兼用の音響用スピーカ、リンガ兼用の音響用スピーカ、バイブレータ兼用の音響用スピーカ、画面表示モニタ兼用の音響用スピーカ、キーパネル兼用の音響用スピーカを含む前記携帯端末装置のデバイスと兼用することを特徴とする、請求項１に記載の携帯端末装置の音響再生システム。
【請求項２７】　前記携帯端末装置には音響信号発生装置が接続され、前記音響信号発生装置は音響データを有し、前記少なくとも２つの音響用スピーカは、前記音響信号発生装置から得た前記音響データを音響再生することを特徴とする、請求項１に記載の携帯端末装置の音響再生システム。
【請求項２８】　前記携帯端末装置には前記音響信号発生装置が複数接続され、スイッチで取得先である音響信号発生装置を切り換えることを特徴とする、請求項２７に記載の携帯端末装置の音響再生システム。
【請求項２９】　前記少なくとも２つの音響用スピーカをアンプレス駆動可能とし、前記携帯端末装置自体の電源を切った状態で、前記音響信号発生装置から得た前記音響データの音響再生を可能にすることを特徴とする、請求項２７に記載の携帯端末装置の音響再生システム。
【請求項３０】　前記携帯端末装置は前記音響信号発生装置からのデータを無線で得ることを特徴とする、請求項２７に記載の携帯端末装置の音響再生システム。
【請求項３１】　前記携帯端末装置にはヘッドホン又はイヤホンが接続され、前記ヘッドホン又はイヤホンから前記少なくとも２つの音響用スピーカに代わり再生音響が聴取されることを特徴とする、請求項１に記載の携帯端末装置の音響再生システム。
【請求項３２】　前記ヘッドホン又はイヤホンから前記少なくとも２つの音響用スピーカからの再生音響と前記携帯端末装置の通話音声とが同時に聴取されることを特徴とする、請求項３１に記載の携帯端末装置の音響再生システム。
【請求項３３】　前記携帯端末装置は伸張式であることを特徴とする、請求項１に記載の携帯端末装置の音響再生システム。
【請求項３４】　前記携帯端末装置は折り畳み式であることを特徴とする、請求項１に記載の携帯端末装置の音響再生システム。
【請求項３５】　携帯端末装置の音響再生方法において、
携帯端末装置に設けられる少なくとも２つの音響用スピーカは、同時に駆動され、互いの再生音響を補助し合うことを特徴とする携帯端末装置の音響再生方法。
【発明の詳細な説明】
【０００１】
【産業上の利用分野】本発明は、携帯電話、ＰＨＳ（Ｐｅｒｓｏｎａｌ　Ｈａｎｄｙ　ＰｈｏｎｅＳｙｓｔｅｍ）、コードレス電話、親子電話の子機、ＰＤＡ（ＰｅｒｓｏｎａｌＤｉｇｉｔａｌ　Ａｓｓｉｓｔａｎｔｓ）等の、無線電話を含む携帯端末装置に関する。特に、本発明は、高音質の音響再生を実現するための携帯端末装置の音響再生システム及び方法に関する。
【０００２】
【従来の技術】従来の携帯電話などの携帯端末装置におけるスピーカ類の設置については、着信を知らせる手段として、ベル音を発生するリンガ、振動を引き起こすバイブレータのためにマイクロモータ等が携帯端末装置の筐体に取り付けられている。また、携帯端末装置の基本機能である受話音の再生、留守録音等の拡声を行うために、マイクロスピーカが取り付けられ、音声を集音するためにマイクロフォンがそれぞれ取り付けられるのが一般的である。
【０００３】特開平１０－２７６２５０号公報には、携帯端末装置において、イヤホン、ヘッドホンを用いてステレオ音響を聴取することが記載されている。この場合、イヤホン、ヘッドホンを長時間使用すると、耳との接触箇所に痛みが生じたり、移動する際に携帯端末装置と一緒に持ち歩かねばならないという不便があり、また複数の人数で同時に聴取できなく、快適さ、利便性という点に関し十分とは言えないという問題があった。
【０００４】さらに、特開平８－１７１４７７号公報にはパーソナルコンピュータ（ＰＣ）、ワークステーション等について、特開平９－１２０３５４号公報にはノート型パーソナルコンピュータについて、イヤホン、ヘッドホン無しのスピーカによるステレオ音響再生が開示されている。スピーカのステレオ音響再生では、音源の空間的広がりや、イヤホン、ヘッドホンには無い後述するクロストークが生じる。このため、左右のスピーカ間の

間隔が一定距離以上に確保され、各左右スピーカに対して受聴者の両耳間の音圧差、位相差が一定値以上に確保される。左右のスピーカが接近して各左右スピーカに対して受聴者の両耳間の音圧差、位相差が小さくなると、クロストークに起因してステレオ効果が無くなり、モノラルに近づいてしまう。

【０００５】ところで、携帯端末装置は、上記パーソナルコンピュータ等よりも小型であるため、当然に左右のスピーカ間の間隔も狭くなり、ステレオ効果を確保することが困難であり、高音質のステレオ再生を実現するのが困難であるという問題を有する。ところで、近年、携帯端末装置は、マルチメディア化が顕著になり、携帯端末装置の内蔵メモリ容量増加、記憶媒体の導入、通信の高速度化により、画像、音楽などの大容量データを扱うようになってきた。さらに、携帯電話を始めとする携帯端末装置の普及率はめざましく、また多くの人が外出時に携帯するため、これに他の付加機能をつけて利便性を向上させるという課題がある。

【０００６】携帯端末装置を用いて、マルチメディアデータがもたらす高品位かつ快適な音響を視聴するためには、携帯端末装置に対し、快適な音響のステレオ再生だけでなく、高品位を確保するために音響の周波数の広帯域性を確保することが要求されるという課題がある。さらに、限られた領域内で複数の人数で聴取したり、周囲への迷惑を回避したり使用環境に適するように、携帯端末装置に対し、音響の指向性を確保することが要求されるという課題がある。

【０００７】また、上記とは逆に、より多くの人と聴取を行うため、音響の無指向性を確保することが要求されるという課題がある。さらに、２カ国語またはそれ以上の音源に対して双方が個別に聴取可能な利便性が要求されるという課題がある。

【０００８】

【発明が解決しょうとする課題】したがって、本発明は上記問題点、要求に鑑みて、快適、高音質な音響再生が可能で、使用環境への高適応性、高利便性を有する携帯端末装置の音響再生システム及び方法を提供することを目的とする。

【０００９】

【課題を解決するための手段】本発明は、前記問題点を解決するために、携帯端末装置の音響再生システムにおいて、携帯端末装置に少なくとも２つの音響用スピーカが設けられ、前記少なくとも２つの音響用スピーカは、同時に駆動され、互いの再生音響を補助し合うことを特徴とする携帯端末装置の音響再生システムを提供する。この手段により、携帯端末装置は、快適、高音質な音響再生を行え、使用環境への高適応性、高利便性を有するようになった。

【００１０】好ましくは、前記少なくとも２つの音響用スピーカは、前記携帯端末装置の長手方向又は対角線の両端に配置される。この手段により、ステレオ音響再生時に音響用スピーカ間のクロストークを回避でき、携帯端末装置では高音質のステレオ音響再生が可能になる。好ましくは、前記少なくとも２つの音響用スピーカの全て又は一部は前記携帯端末装置の筐体壁と角度をもって設置される。

【００１１】この手段により、携帯端末装置が机、床等の低い場所に置かれたとき、少なくとも２つの音響用スピーカからの音響の伝播方向が受聴者に向き、聞きやすくなる。さらに、携帯端末装置が小型化した場合には、少なくとも２つの音響用スピーカが互いに外側に向くことにより、音響用スピーカ間のクロストークを回避することが可能になる。好ましくは、前記少なくとも２つの音響用スピーカの全て又は一部と前記携帯端末装置の筐体壁との角度が自由に変更できる。

【００１２】さらに、好ましくは、前記少なくとも２つの音響用スピーカの全て又は一部は互いの角度が自由に変更される。これらの手段により、携帯端末装置に対する受聴者の位置、携帯端末装置の小型化の状況に応じて、音響用スピーカの角度が任意に変更することができる。

【００１３】好ましくは、前記少なくとも２つの音響用スピーカの間にクロストーク防止壁を設け、前記クロストーク防止壁は、個々の音響用スピーカから発生するクロストークを防ぐ。この手段により、少なくとも２つの音響用スピーカが非常に接近した場合に生じるクロストーク成分が物理的に削除される。好ましくは、前記クロストーク防止壁は折り畳み、取り外し可能である。

【００１４】この手段により、音響用スピーカが不要で、携帯端末装置の持ち運び時にクロストーク防止壁が引っかかったりして破損するのを防止する。好ましくは、前記携帯端末装置にクロストーク削除の信号処理回路を設け、前記クロストーク削除の信号処理回路は、前記少なくとも２つの音響用スピーカへの入力信号を処理してクロストークを削除する。この手段により、クロストーク防止壁なしに音響用スピーカ間のクロストークの削除が可能になる。

【００１５】好ましくは、前記少なくとも２つの音響用スピーカのうち少なくとも一方は携帯端末装置の筐体壁位置より凹んだ位置に設置される。この手段により、凹みを設けなかった場合と比較して、外部への突出部分を低減して引っかかりが少ないクロストーク防止壁が実現できる。好ましくは、前記少なくとも一方の音響用スピーカの一部又は全てを前記携帯端末装置の筐体壁の多孔部で覆うか又は前記スピーカの振動面を覆う筐体壁を削除する。

【００１６】この手段により、音響用スピーカからの音響の音圧を向上することが可能になる。好ましくは、前記少なくとも一方の音響用スピーカは、前記携帯端末装置の両端の側面からはみ出して設置される。この手段に

より、音響用スピーカ間の距離が大きくなり、音響用スピーカ間のクロストークを低減でき、クロストーク防止壁なしで高音質のステレオ音響再生が可能になる。

【００１７】好ましくは、前記少なくとも一方の音響用スピーカは前記携帯端末装置の前面から奥の方に位置し、前記少なくとも一方の音響用スピーカの一部を前記携帯端末装置の筐体壁の多孔部で覆うか又は前記少なくとも一方の音響用スピーカの振動面を覆う筐体壁を削除する。この手段により、音響用スピーカ間の距離が大きくなり、音響用スピーカ間のクロストークを低減でき、クロストーク防止壁なしで高音質のステレオ音響再生が可能になると同時に音響用スピーカの音圧を大きくすることが可能になる。

【００１８】好ましくは、はみ出した前記少なくとも一方の音響用スピーカが前記携帯端末装置内に収納される。この手段により、携帯端末装置の携帯時に突出している音響用スピーカが収納されるので、持ち運び時に引っかかったりする障害となることが回避できる。好ましくは、前記少なくとも２つの音響用スピーカは前記携帯端末装置に一列のスピーカアレイに配列される。

【００１９】この手段により、スピーカアレイの方向に指向性が向上するので、携帯端末装置を用いて、喫茶店などの場所で、少人数の受聴者で音響を聴取するときなど、受聴者のみに音響が到達し、第３者には音響が到達しなようにすることができ、ヘッドホンなどを用いることなく、周囲への迷惑を回避した音響聴取が可能になる。好ましくは、前記少なくとも２つの音響用スピーカは異なる方向に向けて前記携帯端末装置に配列される。

【００２０】この手段により、音響用スピーカを互いに外向きに設置することが可能になるので、音響用スピーカの音響のクロストークは小さくなり、より高音質のステレオ音響再生が実現可能になる。さらに、音響用スピーカを携帯端末装置の四方に向けて設置することにより、より無指向性の効果を向上させることができる。これにより、多人数の受聴者に聴取させる場合に便利である。好ましくは、前記少なくとも２つの音響用スピーカは異なる方向に個々に異なる音響が聴取されるように音響再生を行う。

【００２１】この手段により、個々に異なる音響として、例えば、２カ国語の音声が複数人で聴取され、１台の携帯端末装置１で複数の言語を同時に聴取することが可能になる。好ましくは、前記携帯端末装置に指向性の絞り信号処理回路が設けられ、前記指向性の絞り信号処理回路は、前記少なくとも２つの音響用スピーカへの入力信号を処理し指向性の方向を絞る。

【００２２】この手段により、少ない数の音響用スピーカで音響伝播の指向性が信号処理により一定方向に絞られる。好ましくは、前記携帯端末装置に無指向性信号処理回路を設け、前記無指向性信号処理回路は前記少なくとも２つの音響用スピーカの入力信号を処理し、無指向性にする。この手段により、少ない数の音響用スピーカで音響伝播がより広角に広がる無指向性が実現されることにより、１台の携帯端末装置にて音響用スピーカを増設することなく、多人数の受聴者により音響聴取が可能になる。

【００２３】好ましくは、前記携帯端末装置に前記少なくとも２つの音響用スピーカの指向性に関する方向を絞る指向性の絞り信号処理回路と、前記少なくとも２つの音響用スピーカを無指向性にする無指向性信号処理回路とを設け、前記指向性の絞り信号処理回路、前記無指向性信号処理回路が択一的に選択される。この手段により、信号処理機能を選択可能にしたので、状況に応じて最適な信号処理を行うことが可能になると同時に、常に快適な音響聴取が可能になる。

【００２４】好ましくは、高効率な前記少なくとも２つの音響用スピーカを用い、音響再生時にアンプレスの駆動を可能にする。この手段により、音響用スピーカに高効率なものを適用することにより、アンプレスの駆動が可能な構造となり、アンプが不要となることで、携帯端末装置の部品点数が低減され、小型軽量化が実現でき、低消費電力化が実現され、１回の充電での携帯端末装置の未使用可能時間が増加する。

【００２５】好ましくは、前記少なくとも２つの音響用スピーカから個々の音響を再生し、個々の音響の音量を独自に調整可能にする。この手段により、例えば、２カ国語を聴取しながら、外国語を学ぶような場合、外国に比して母国語の音量を小さくした聴取により学習能率が向上できる。好ましくは、前記少なくとも２つの音響用スピーカは、中音～高音域に特化した特性、低音域に特化した特性をそれぞれ有する。

【００２６】この手段により、高帯域でより高音質の音響再生が可能になる。好ましくは、前記少なくとも２つの音響用スピーカは、前記携帯端末装置が机、床、壁際を含む面に接して設置された際に、音響の反射が利用できるようにする。この手段により、携帯端末装置が机等の面に接した際に、低音成分が机等の面で反射して位相が逆転して、音響用スピーカの前方から出る低音成分と同相になり、前方から出る低音成分を補強することが可能になる。

【００２７】好ましくは、前記少なくとも２つの音響用スピーカの音響再生と前記携帯端末装置の通話を同時に可能にする。さらに、好ましくは、前記少なくとも２つの音響用スピーカの音響再生信号が前記携帯端末装置の通話相手にも聴取可能なように送信される。これらの手段により、携帯端末装置を用いてＢＧＭを伴った会話の実現が可能になる。

【００２８】好ましくは、前記少なくとも２つの音響用スピーカの少なくとも１つは、通話マイクロフォン兼用の音響用スピーカ、受話スピーカ兼用の音響用スピーカ、リンガ兼用の音響用スピーカ、バイブレータ兼用の

音響用スピーカ、画面表示モニタ兼用の音響用スピーカ、キーパネル兼用の音響用スピーカを含む前記携帯端末装置のデバイスと兼用する。

【００２９】この手段により、音響用スピーカとデバイスとを兼用することで、携帯端末装置の部品点数が低減され、小型軽量化が実現できる。好ましくは、前記携帯端末装置には音響信号発生装置が接続され、前記音響信号発生装置は音響データを有し、前記少なくとも２つの音響用スピーカは、前記音響信号発生装置から得た前記音響データを音響再生する。

【００３０】この手段により、携帯端末装置を外付け音響用スピーカのように機能させ、他の音源からの音響を再生する機能を付加することにより、より多くの音響データに対応可能になるとともに、携帯端末装置以外に音響用スピーカを別途携帯することが不要となる。好ましくは、前記携帯端末装置には前記音響信号発生装置が複数接続され、スイッチで取得先である音響信号発生装置を切り換える。

【００３１】この手段により、複数の音源からの音響が容易に比較できるなど、利便性が向上する。好ましくは、前記少なくとも２つの音響用スピーカをアンプレス駆動可能とし、前記携帯端末装置自体の電源を切った状態で、前記音響信号発生装置から得た前記音響データの音響再生を可能にする。

【００３２】この手段により、外部からの入力信号を再生する場合、携帯端末装置自体の電源を切った状態での音響再生が可能になる。これにより、携帯端末装置が節電され、１回の充電に対する使用可能時間が増加し、バッテリーの残量にとらわれることなく、高音質の音響再生が可能になる。好ましくは、前記携帯端末装置は前記音響信号発生装置からのデータを無線で得る。この手段として、ｂｌｕｅｔｏｏｔｈなどの適用が可能であり、ケーブルが不要となるので、システムの構成を簡素化できる。好ましくは、前記携帯端末装置にはヘッドホン又はイヤホンが接続され、前記ヘッドホン又はイヤホンから前記少なくとも２つの音響用スピーカに代わり再生音響が聴取される。

【００３３】さらに、好ましくは、前記ヘッドホン又はイヤホンから前記少なくとも２つの音響用スピーカからの再生音響と前記携帯端末装置の通話音声とが同時に聴取される。これらの手段により、周囲の多大な迷惑とならずに、心地よいＢＧＭを伴った会話が実現できる。また、ＢＧＭに駅の騒音、雑踏、デパート、居酒屋の喧騒など選択することにより、より会話を弾ませることが可能になる。好ましくは、前記携帯端末装置は伸張式であり、さらに、好ましく、前記携帯端末装置は折り畳み式である。

【００３４】これらの手段により、本発明は、伸張式、折り畳み式の携帯端末装置にも、同様に、適用可能であり、高音質のステレオ音響再生が可能である。さらに、本発明は、携帯端末装置の音響再生方法において、携帯端末装置に設けられる少なくとも２つの音響用スピーカは、同時に駆動され、互いの再生音響を補助し合うことを特徴とする携帯端末装置の音響再生方法を提供する。

【００３５】この手段により、上記発明と同様に、携帯端末装置は、快適、高音質な音響再生を行え、使用環境への高適応性、高利便性を有するようになった。

【００３６】

【発明の実施の形態】以下、本発明の実施の形態について図面を参照して説明する。図１は本発明に係る携帯端末装置の音響再生システムにおける第１の実施の形態を示す概略構成を示す図である。本図に示すように、携帯端末装置１には、メニュー、電話番号、機能等の表示を行うために液晶（ＬＣＤ）で構成される画面表示モニタ１１、メニューの選択操作電話番号の入力操作、機能選択操作等を行うキーパネル１２、受信した音声をスピーカから聞くための受話口１３、送信すべき音声をマイクロフォンに伝えるための送話口１４と、受信電波を受信信号に変換し、送信信号を送信電波に変換するアンテナ１５等からなる。

【００３７】さらに、携帯端末装置１には、ステレオ音響再生を行う音響用スピーカ２ａ、２ｂが設けられる。音響用スピーカ２ａ、２ｂは、携帯端末装置１の前面に、長手方向に対角線上に両端に位置し、携帯端末装置１の前面に向けられ、音響用スピーカ２ａ、２ｂ間の間隔が最大になるように配置されている。

【００３８】図２は、図１の音響用スピーカ２ａ、２ｂのステレオ音響再生を説明する図である。本図に示すように、音響用スピーカ２ａ、２ｂにより、左（Ｌｅｆｔ；Ｌ）、右（Ｒｉｇｈｔ；Ｒ）信号がステレオ音響再生され、ステレオ音響再生された音響が受聴者に達する。

【００３９】このような設置により、音響用スピーカ２ａ、２ｂの快適で高音質な音響再生が可能になる。すなわち、従来のように、ヘッドホン、イヤホン、外付けスピーカシステムなどを用いることなく、携帯端末装置１のみでステレオ音響再生が可能となる。第１の実施の形態に関する第１の変形例として、携帯端末装置１が机、床、壁際などの面に接して設置された際に、音響用スピーカ２ａ、２ｂの裏面を解放する構造にし、音響の反射が利用できるようにする。

【００４０】携帯端末装置１は、小型であるため、低音再生が困難である。本発明により、携帯端末装置１が机等の面に接した際に、低音成分が机等の面で反射して位相が逆転して、音響用スピーカ２ａ、２ｂの前方から出る低音成分と同相になり、前方から出る低音成分を補強することが可能になる。なお、携帯端末装置１が机等の面に接していない場合には、音響用スピーカ２ａ、２ｂの裏面を閉じ、低音成分が回折効果により、音響用スピーカ２ａ、２ｂの前方に回り込んで低音成分の音圧を小

さくしないようにする。

【００４１】第１の実施の形態に関する第２の変形例として、音響用スピーカ２ａ、２ｂに高効率なものを適用することにより、アンプレスの駆動が可能な構造にする。このようにアンプが不要となることで、携帯端末装置１の部品点数が低減され、小型軽量化が実現でき、低消費電力化が実現され、１回の充電での携帯端末装置１の未使用可能時間が増加する。

【００４２】第１の実施の形態に関する第３の変形例として、音響再生と通話が同時に可能な構成とする。また、音響再生信号が通話相手にも聴取可能なように送信される。これによりＢＧＭを伴った会話の実現が可能になる。第１の実施の形態に関する第４の変形例として、音響用スピーカ２ａ、２ｂから個々の音響を再生し、個々の音響の音量を独自に調整可能な構造にする。

【００４３】これにより、例えば、２カ国語を聴取しながら、外国語を学ぶような場合、外国語に比して母国語の音量を小さくした聴取により学習能率が向上できる。図３は本発明に係る携帯端末装置の音響再生システムにおける第２の実施の形態を示す概略構成を示す図である。本図に示すように、図１と比較して、携帯端末装置１は伸張式であり、音響用スピーカ２ａ、２ｂは、携帯端末装置１の前面に、長手方向に対角線上に両端に位置する。

【００４４】本図（ａ）、本図（ｂ）に示すように、携帯端末装置１のフリップ部が伸張されることで、音響用スピーカ２ａ、２ｂ間の距離が広がり、音響用スピーカ２ａ、２ｂ間の間隔が最大になる。これにより、音響用スピーカ２ａ、２ｂにおけるクロストークが低減される。本発明は、伸張式の携帯端末装置１に適用されるので、移動時の持ち運びの利便性に加えて、高音質のステレオ音響再生を提供することが可能になる。

【００４５】図４は本発明に係る携帯端末装置の音響再生システムにおける第３の実施の形態を示す概略構成を示す図である。本図に示すように、図１と比較して、音響用スピーカ２ａ、２ｂは、携帯端末装置１の前面に、長手方向の同一辺の両端に位置し、音響用スピーカ２ａ、２ｂ間の間隔が最大になるように配置されている。

【００４６】携帯端末装置１では机、床など受聴者の耳よりも低い位置に設置される状態を想定して音響用スピーカ２ａ、２ｂが、以下のように、設置される。図５は図４におけるＢａ－Ｂａ’又はＢｂ－Ｂｂ’断面図である。本図に示すように、音響用スピーカ２ａ、２ｂは、その設置箇所の携帯端末装置１の筐体壁とある角度をもって設置され、音響用スピーカ２ａ、２ｂからの音響は受聴者の位置５に音響の伝播方向７に沿って達する。

【００４７】なお、音響用スピーカ２ａ、２ｂと筐体壁との角度、互いの角度は自由に変更することが可能である。このように、音響用スピーカ２ａ、２ｂの方向を受聴者の位置に向けることで、より聴取しやすい音響の実現が可能になる。図６は本発明に係る携帯端末装置の音響再生システムにおける第４の実施の形態を示す概略構成を示す図であり、図７は図６におけるＢ－Ｂ’断面図である。

【００４８】図６に示すように、図２と比較して、音響用スピーカ２ａ、２ｂは、携帯端末装置１の前面に、長手方向の同一辺の両端に位置する点では同一であるが、図７に示すように、音響用スピーカ２ａ、２ｂは互いに外向きに設置される。なお、音響用スピーカ２ａ、２ｂを互いに外向きにする角度は自由に変更することが可能である。

【００４９】携帯端末装置１の小型化がさらに進み、音響用スピーカ２ａ、２ｂ間の間隔が小さくなると想定する。これにともなって、音響用スピーカ２ａ、２ｂ間でクロストークが増大して、ステレオ効果を喪失するが、図６に示すように、音響用スピーカ２ａ、２ｂは互いに外向きに設置することにより、以下に説明するように、このクロストークを低減する。

【００５０】図８は図６、図７における音響用スピーカ２ａ、２ｂのクロストークの低減を説明する図である。本図（ａ）の場合、受聴者に対して、音響用スピーカ２ａ、２ｂは同じ方向に向いている。音響用スピーカ２ａからの音響の伝播方向７ａは、受聴者の左耳に向かう伝播方向７ａＬ、クロストーク（点線）として右耳に向かう伝播方向７ａＲからなり、音響用スピーカ２ｂからの音響の伝播方向７ｂは、クロストーク（点線）として受聴者の左耳に向かう伝播方向７ｂＬ、右耳に向かう伝播方向７ａＲからなる。

【００５１】なお、ヘッドホン、イヤホンでは、音響が空間を伝播しないので、このようなクロストークは存在しない。音響用スピーカ２ａ、２ｂ間の間隔が一定距離以上あれば、音響用スピーカ２ａ、２ｂから伝播方向７ａＬ及び７ａＲの音響、伝播方向７ｂＲ及び７ｂＬの音響により受聴者の両耳でそれぞれ形成される音圧差、位相差が大きく、それらの極性が相互に逆であるので、音響用スピーカ２ａ、２ｂが形成する音源が識別される。

【００５２】しかしながら、音響用スピーカ２ａ、２ｂが接近すると、音響用スピーカ２ａ、２ｂからの音波が受聴者の両耳でそれぞれ形成する音圧差、位相差が小さい状態で、受聴者の右耳に伝播方向７ｂＲ及び７ａＲ、左耳に７ａＬ及び７ｂＬが達するので、ステレオ効果が喪失し、モノラル効果が得られるだけになる。本図（ｂ）に示すように、音響用スピーカ２ａ、２ｂは互いに外向きに設置されると、音響用スピーカ２ａから受聴者の右耳に向かう伝播方向７ａＲの音響が右耳に達せず、さらに、音響用スピーカ２ｂから受聴者の左耳に向かう伝播方向７ｂＬの音響が左耳に達しなくなる割合が増加し、クロストークが低減する。

【００５３】このクロストークが低減するため、受聴者の右耳には音響用スピーカ２ｂからの音響が達し、受聴

者の左耳には音響用スピーカ２ａからの音響が達する割合が増加する。このため、受聴者は、音響用スピーカ２ａ、２ｂの音源をそれぞれ識別することが可能になるので、音響用スピーカ２ａ、２ｂの間の間隔が小さくなっても、ヘッドホン、イヤホンと同様なステレオ効果を得ることが可能になる。

【００５４】図９は本発明に係る携帯端末装置の音響再生システムにおける第５の実施の形態を示す概略構成を示す図である。本図に示すように、図１と比較して、音響用スピーカ２ａは、携帯端末装置１の正面、上面及び正面からみて左側面にかかって配置されたスピーカであり、音響用スピーカ２ｂは、携帯端末装置１の正面、下面及び正面からみて左側面にかかって配置されたスピーカである。

【００５５】本発明では、図７、図８で説明したように、クロストーク低減の効果による高音質のステレオ音響再生に加え、図４で説明したように、携帯端末装置１を机、床など受聴者の耳より低い位置に設置した状態で音響用スピーカ２ａ、２ｂの音響の伝播方向を受聴者に向ける構造とするため、より音響を聴取しやすくなる。図１０は本発明に係る携帯端末装置の音響再生システムにおける第６の実施の形態を示す概略構成を示す図である。

【００５６】本図に示すように、図１と比較して、携帯端末装置１は折り畳み式であり、音響用スピーカ２ａは、携帯端末装置１の正面、上面及び正面からみて左側面にかかって設置されたスピーカであり、音響用スピーカ２ｂは、携帯端末装置１の正面、下面及び正面からみて左側面にかかって設置されたスピーカである。本発明は、図９に示した例と比較して、折り畳み式の携帯端末装置１に適用されるので、移動時の持ち運びの利便性に加えて、高音質のステレオ音響再生を提供することが可能になる。

【００５７】次に、音響用スピーカ同士の間隔は広い方が望ましいが、小型軽量化が進む携帯端末装置１では、携帯端末装置１のサイズ、他の部品の配置により個々の音響用スピーカ間の距離などの寸法は、自ずと限られてしまう。このような場合について、以下に説明を行う。図１１は本発明に係る携帯端末装置の音響再生システムにおける第７の実施の形態を示す概略構成を示す図であり、図１２は図１１における音響用スピーカ２ａ、２ｂを含むＡ－Ａ’断面を矢印方向から見た概略構成図である。

【００５８】本図に示すように、図１と比較して、音響用スピーカ２ａ、２ｂは、携帯端末装置１の前面に、音響用スピーカ２ａ、２ｂの表面と携帯端末装置１の表面が一致し、横方向に並んで、携帯端末装置１の前面に向けて、画面表示モニタ１１とキーパネル１２の間に位置する。音響用スピーカ２ａ、２ｂの間には、クロストーク防止壁８が設けられ、クロストーク防止壁８は、音響用スピーカ２ａ、２ｂの表面から外側に突出した壁で、音響用スピーカ２ａ、２ｂが接近して設置される場合に、音響用スピーカ２ａ、２ｂ間に生じるクロストークを、以下のように、低減し、高音質なステレオ音響再生を実現する。

【００５９】図１３は図１１、図１２における音響用スピーカ２ａ、２ｂのクロストークの低減を説明する図である。本図（ａ）では、図７で説明したように、音響用スピーカ２ａ、２ｂ間には、クロストークが発生する。本図（ｂ）に示すように、クロストーク防止壁８により、音響用スピーカ２ａ、２ｂ間のクロストーク７ａＬ、７ｂＲが物理的に遮蔽され、受聴者の左耳、右耳にそれぞれ達しない。このため、高音質なステレオ音響再生を実現することが可能になる。

【００６０】なお、クロストーク防止壁８は、携帯端末装置１から突出するため、携帯端末装置１を移動する際に引っかけるなど障害となり得る。そこで、本発明における第７の実施の形態に関する第１の変形例として、クロストーク防止壁８は、使用が不要な場合には、折り畳んだり、取り外し等の移動可能な構造とし、音響を聴取するときのみ携帯端末装置１にセットする構造とする。

【００６１】これにより、持ち運び時には、破損等の障害とならず、且つ、音響聴取時には高音質のステレオ音響再生が可能となる。なお、このクロストーク防止壁８は図１１中の上下方向に対し長さを延長した構造とすることができる。クロストーク防止壁８が上下方向に短い場合、防止壁のある部分ではクロストークは回避されるが、防止壁が途切れた位置ではクロストークの要因が生じることとなる。しかし、クロストーク防止壁８を上下方向に長くすることで、よりクロストークを低減することが可能になる。また、携帯端末装置１内にクロストーク防止壁８の収納スペースを設け、取り外したクロストーク防止壁８を収納することにより、クロストーク防止壁８の紛失を回避することが可能になる。

【００６２】図１４は図１１における第７の実施の形態に関する概略構成の第２の変形例を示す図である。本図に示すように、図１１におけるＡ－Ａ’に相当する断面での構成では、音響用スピーカ２ａ、２ｂは、携帯端末装置１の筐体壁位置６より凹んだ位置に設置され、音響用スピーカ２ａ、２ｂ間の境界８’で分けられている。

【００６３】この境界８’が図１１、図１２の実施の形態で設けられたクロストーク防止壁８に類似の効果をもたらすことにより、外部に突出しないクロストーク防止壁が実現でき、且つ、音響聴取時には高音質なステレオ音響再生を実現可能にする。図１５は図１１における第７の実施の形態に関する概略構成の第３の変形例を示す図である。

【００６４】本図に示すように、音響用スピーカ２ａ、２ｂは、携帯端末装置１の筐体壁位置６よりそれぞれ凹んだ位置に設置される。クロストーク防止壁８は音響用

スピーカ２ａ、２ｂ間の音響のクロストークを防止する。一般的に、クロストーク防止壁８は、その高さが高いほどその効果が高くなるが、携帯端末装置１の筐体壁位置６から突出すると、障害になり得る。

【００６５】このため、このように凹んで設置された状態の音響用スピーカ２ａ、２ｂに対して、クロストーク防止壁８が設けられることにより、凹みの深さ分だけ、突出量が減少するため、音響用スピーカ２ａ、２ｂを携帯端末装置１の筐体壁位置６に近接して設置し、凹みを設けなかった場合（図１２）と比較して、外部への突出部分を低減したクロストーク防止壁８が実現できる。且つ音響聴取時には高音質のステレオ音響再生が可能になる。

【００６６】図１６は本発明に係る携帯端末装置の音響再生システムにおける第８の実施の形態を示す概略構成を示す図である。本図に示すように、図１と比較して、音響用スピーカ２ａは、携帯端末装置１の正面から見て左側に側面からはみ出して、携帯端末装置１の正面側に向けて設置され、音響用スピーカ２ｂは、携帯端末装置１の正面から見て右側に側面からはみ出して、携帯端末装置１の正面側に向けて設置される。

【００６７】音響用スピーカ２ａ、２ｂは、その設置位置の携帯端末装置１の筐体壁とは９０度に近い角度をもって設置されている。このように携帯端末装置１の側面に音響用スピーカ２ａ、２ｂをはみ出して設置することで、音響用スピーカ２ａ、２ｂ間の距離は、図１１に記載した本発明における第６の実施の形態例と比較して広がるため、クロストーク防止壁８なしに音響用スピーカ２ａ、２ｂから生じるクロストークが低減できる。よって、部品点数を低減すると共に高音質なステレオ音響再生が実現可能になる。

【００６８】また、音響用スピーカ２ａ、２ｂを、携帯端末装置１の前面から裏面に向けて、より奥に深く設置することにより、携帯端末装置１自体が音響用スピーカ２ａ、２ｂのクロストーク防止壁のような役割を果たすことで、音響用スピーカ２ａ、２ｂから生じる音響のクロストークがより低減でき、高音質なステレオ音響再生が実現可能になる。なお、前述のように、音響用スピーカ２ａ、２ｂと筐体壁との角度は自由に変更することが可能である。また、音響用スピーカ２ａ、２ｂが携帯端末装置１からはみ出すことで、持ち歩きなど携帯時の障害となる可能性がある。そこで、第８の実施の形態に関する変形例として、音響用スピーカ２ａ、２ｂを携帯端末装置１の筐体内に収納可能にし、音響用スピーカ２ａ、２ｂ使用時には筐体から引き出す方式にする。これにより、音響用スピーカ２ａ、２ｂが携帯時に障害となることを回避できるようになる。

【００６９】図１７は本発明に係る携帯端末装置の音響再生システムにおける第９の実施の形態を示す概略構成を示す図である。本図に示すように、図１１と比較して、音響用スピーカ２ａは携帯端末装置１の正面から見て左側に側面からはみ出して、携帯端末装置１の正面側に向けて設置され、音響用スピーカ２ｂは携帯端末装置１の正面から見て右側に側面からはみ出して、携帯端末装置１の正面側に向けて設置される。さらに、音響用スピーカ２ａ、２ｂは携帯端末装置１の前面から少し離れた奥に設置される。図１６にて述べた本発明における第７の実施の形態から、さらに、音響用スピーカ２ａ、２ｂの前面で、音響用スピーカ２ａ、２ｂを遮る位置にある筐体壁を削除することで、音響用スピーカ２ａ、２ｂの振動面が筐体壁に覆われないようにする。このため、音響用スピーカ２ａ、２ｂ前面からの音響が受聴者に到達し、音圧がより向上できる。

【００７０】音響用スピーカ２ａ、２ｂを携帯端末装置１の前面から突出させないので、音響用スピーカ２ａ、２ｂ間の携帯端末装置１本体が両スピーカ間のクロストーク防止壁の役割を果たし、より高音質のステレオ音響再生が可能になる。なお、前述のように、音響用スピーカ２ａ、２ｂが携帯端末装置１からはみ出すことで、持ち歩きなど携帯時の障害となる可能性がある。そこで、第９の実施の形態に関する変形例として、音響用スピーカ２ａ、２ｂを携帯端末装置１の筐体内に収納可能にし、音響用スピーカ２ａ、２ｂ使用時には筐体から引き出す方式にする。これにより、音響用スピーカ２ａ、２ｂが携帯時に障害となることを回避できるようになる。

【００７１】図１８は本発明に係る携帯端末装置の音響再生システムにおける第１０の実施の形態を示す概略構成を示す図である。本図に示すように、図１１と比較して、音響用スピーカ２ａは、携帯端末装置１の正面及び正面から見て左側面にかかって設置され、音響用スピーカ２ｂは、携帯端末装置１の正面及び正面から見て右側面にかかって設置される。

【００７２】本発明では、図１６と比較して、音響用スピーカ２ａ、２ｂを筐体壁から突出させないため、音響用スピーカ２ａ、２ｂが障害にならずに移動時に音響用スピーカ２ａ、２ｂを引っかけるなどの事態から回避できる。さらに、音響用スピーカ２ａ、２ｂを互いに外向きに設置することにより、音響用スピーカ２ａ、２ｂの音響のクロストークは小さくなり、より高音質のステレオ音響再生が実現可能になる。

【００７３】図１９は本発明に係る携帯端末装置の音響再生システムにおける第１１の実施の形態を示す概略構成を示す図であり、図２０は図１９における音響用スピーカ２ａ、２ｂを含むＡ－Ａ’断面を矢印方向から見た概略構成図である。本図に示すように、図１と比較して、音響用スピーカ２ａ、２ｂは、携帯端末装置１の前面に、音響用スピーカ２ａ、２ｂの表面と携帯端末装置１の表面が一致し、横方向に並んで、画面表示モニタ１１とキーパネル１２の間に位置する。

【００７４】なお、図１１のクロストーク防止壁８が設

けられないので、クロストーク防止壁８に代わり、以下のクロストークを削除する信号処理が行われる。図２１はクロストーク削除の信号処理を行う回路の概略を示す図である。本図に示すように、音響用スピーカ２ａ、２ｂへの左（Ｌ）、右（Ｒ）信号の分岐信号をそれぞれ入力する逆フィルタ２０ａ、２０ｂが設けられる。

【００７５】逆フィルタ２０ａ、２０ｂは、入力した分岐信号の位相を反転処理する。左（Ｌ）、右（Ｒ）信号の分岐点と音響用スピーカ２ａ、２ｂとの間にそれぞれ加算器２１ａ、２１ｂが設けられる。加算器２１ａ、２１ｂは右（Ｒ）、左（Ｌ）信号と逆フィルタ２０ａ、２０ｂの出力信号とをそれぞれ加算して、音響用スピーカ２ａ、２ｂにそれぞれ出力する。

【００７６】図２２は図２１のクロストークの削除動作を説明する図である。本図（ａ）に示すように、音響用スピーカ２ａ、２ｂから受聴者への音響の伝播方向７ａ、７ｂには、前述のように、クロストークとして、７ａＲ、７ｂＬが含まれる。本図（ｂ）に示すように、クロストークの信号処理により、前述のクロストーク防止壁８を用いずに、クロストークとしての伝播方向７ａＲ、７ｂＬの音響が位相反転した音響で相殺され削除される。

【００７７】図２３は図２０における第１１の実施の形態に関する第１の変形例を示す図である。本図に示すように、音響用スピーカ２ａ、２ｂは、携帯端末装置１の筐体壁６より凹んだ位置に設置される。これにより音響用スピーカ２ａ、２ｂの設置面に対する携帯端末装置１の筐体壁６には、その一部又は全体にキーパネルなどを構成することで、携帯端末装置１内の効率良い部品配置が可能になる。

【００７８】図２４は図２０における第１１の実施の形態に関する第２の変形例を示す図である。本図に示すように、音響用スピーカ２ａ、２ｂを携帯端末装置１の筐体から部分的に突出させることにより、突出部分に対応する筐体の内部空間が節約され、この部分に対し他の部品を配置したり、筐体全体を小さくするなどが可能になり、携帯端末装置１の、より小型軽量化が実現可能になる。

【００７９】図２５は本発明に係る携帯端末装置の音響再生システムにおける第１２の実施の形態を示す概略構成を示す図であり、図２６は図２５における音響用スピーカ２ａ、２ｂを含むＡ－Ａ’断面を矢印方向から見た概略構成図である。本図に示すように、図１９と比較して、音響用スピーカ２ａ、２ｂは、キーパネル１２にかかり、携帯端末装置１の筐体内部に、凹ませて、設けられる。このように、前記音響用スピーカの携帯端末筐体壁に対する面積占有率が低減される構造とすることで、携帯端末筐体壁をキーパネルなど他の用途に活用でき、携帯端末装置の小型化が実現できる。

【００８０】さらに、音響用スピーカ２ａ、２ｂは、筐体壁の多孔部６’により覆われるようにしたので、筐体壁の多孔部６’を通して音響が筐体外に伝播され、十分な音圧が得られる。なお、図２１の信号処理回路により、音響用スピーカ２ａ、２ｂのクロストークが削除される。このようにして、音響聴取時には、十分な音圧で高音質なステレオ音響再生の実現が可能になる。

【００８１】図２７は本発明に係る携帯端末装置の音響再生システムにおける第１３の実施の形態を示す概略構成を示す図であり、図２８は図２７における携帯端末装置の側面図である。本図に示すように、図２と比較して、音響用スピーカ２ａ、２ｂは、携帯端末装置１の前面に向けて、長手方向の同一辺の両端に位置し、音響用スピーカ２ｃは、携帯端末装置１の背面に向けて、長手方向の中央に位置する。すなわち、音響用スピーカ２ｃは、音響用スピーカ２ａ、２ｂに対して、１８０度の向きをもつように配置される。

【００８２】音響用スピーカ２ａ、２ｂには中音～高音域に特化した特性が与えられ、音響用スピーカ２ｃには低音域に特化した特性を与え、ウーファのように動作させることにより、広帯域でより高音質の音響再生が可能になる。さらに、本発明における第１２の実施の形態に関する変形として、音響用スピーカ２ａ、２ｂ、２ｃの方向を可動式の構造にする。

【００８３】例えば、携帯端末装置１を低い位置に置いた場合には音響用スピーカ２ａ、２ｂ、２ｃを上向きにセットし、多人数で聴取するなど広域の音響を得たいときには外向きにセットし聞きやすくするといったように、場合に応じて最適なスピーカ方向を選択することが可能になり、より汎用性が向上できる。図２９は本発明に係る携帯端末装置の音響再生システムにおける第１４の実施の形態を示す概略構成を示す図である。

【００８４】本図に示すように、携帯端末装置１には音響スピーカアレイ２ｓが設けられ、音響スピーカアレイ２ｓは、携帯端末装置１の長手方向に一列に携帯端末装置１の背面に向けて配列される複数の音響用スピーカの配列である。図３０は図２９の音響スピーカアレイ２ｓの指向性を示す図である。本図に示すように、音響スピーカアレイ２ｓの方向に指向性が向上する。本携帯端末装置１を用いて、喫茶店などの場所で、少人数の受聴者で音響を聴取するときなど、受聴者のみに音響が到達し、第３者には音響が到達しなようにすることができ、ヘッドホンなどを用いることなく、周囲への迷惑を回避した音響聴取が可能になる。

【００８５】図３１は本発明に係る携帯端末装置の音響再生システムにおける第１５の実施の形態を示す概略構成を示す図である。本図に示すように、図１と比較して、携帯端末装置１の周囲に音響用スピーカ２ａ、２ｂ、２ｃ、２ｄが設けられる。このように、音響用スピーカ２ａ、２ｂ、２ｃ、２ｄを四方に向けて設置することにより、より無指向性の効果を向上させることができ

る。これにより、多人数の受聴者に聴取させる場合に便利である。

【００８６】次に、音響用スピーカの数を増加させることなく、音響伝播の指向性を一定方向に絞る例、音響伝播をより広角に広げる無指向性にする例を説明する。図３２は本発明に係る携帯端末装置の音響再生システムにおける第１６の実施の形態を示す概略構成を示す図である。本図に示すように、図２９と比較して、２つだけの音響用スピーカ２ａ、２ｂが携帯端末装置１の長手方向の両端に携帯端末装置１の背面に向けて設けられる。音響用スピーカ２ａ、２ｂの音響伝播の指向性は、以下のように、信号処理により一定方向に絞られる。

【００８７】図３３は図３２の音響用スピーカ２ａ、２ｂの指向性を絞る信号処理の回路例を説明する図である。本図（ａ）に示すように、音響用スピーカ２ａ、２ｂのうち、例えば、音響用スピーカ２ｂの入力側に遅延器２２が設けられる。遅延器２２がない場合には、音響用スピーカ２ａ、２ｂの点線で示す音響伝播の方向に指向性が絞られているとする。

【００８８】遅延器２２がある場合には、右（Ｒ）信号が左（Ｌ）信号よりも遅延して、音響用スピーカ２ａ、２ｂが形成する音響の指向性は、本図（ａ）に示すように、遅延がない場合から遅延がある場合に方向が絞られる。任意の遅延量の設定により、音響の指向性の方向を任意に絞ることが可能になる。

【００８９】本図（ｂ）に示すように、音響用スピーカ２ａ、２ｂのうち、例えば、音響用スピーカ２ｂの入力側に減衰器２３が設けられる。減衰器２３がない場合には、音響用スピーカ２ａ、２ｂの点線で示す音響伝播の方向に指向性が絞られているとする。減衰器２２により、右（Ｒ）信号が左（Ｌ）信号よりも小さな振幅となり、音響用スピーカ２ａ、２ｂが形成する音響の指向性は、本図（ａ）に示すように、減衰がない場合から減衰がある場合に方向が絞られる。

【００９０】任意の減衰量の設定により、音響の指向性の方向を任意に絞ることが可能になる。このようにして、指向性が一定方向に絞られるので、喫茶店などの場所で少人数で音響を聴取するときなどに、受聴者のみに音響が到達し、第３者には音響が到達しないようにすることで、ヘッドホン、イヤホンなどを用いずに周囲への迷惑を回避した音響の聴取が、少数の音響用スピーカで、可能になる。

【００９１】図３４は図３２における第１６の実施の形態に関する第１の変形例であり、音響用スピーカ２ａ、２ｂの指向性を無指向性にする信号処理の回路例を説明する図である。本図に示すように、音響用スピーカ２ａの入力側に、左（Ｌ）信号を分岐して遅延する遅延器２４ａと、遅延器２４ａにより遅延された信号を元の左（Ｌ）信号に加算して音響用スピーカ２ａに出力する加算器２５ａが設けられる。

【００９２】さらに、音響用スピーカ２ｂの入力側に、右（Ｒ）信号を分岐して遅延する遅延器２４ｂと、遅延器２４ｂにより遅延された信号を元の右（Ｒ）信号に加算して音響用スピーカ２ｂに出力する加算器２５ｂが設けられる。双方に遅延がない左（Ｌ）信号、右（Ｒ）信号により音響用スピーカ２ａ、２ｂからの音響伝播の方向は、本図に示すように、（ａ）方向になる。

【００９３】遅延がある右（Ｒ）信号と遅延がない左（Ｌ）信号により音響用スピーカ２ａ、２ｂからの音響伝播の方向は、本図に示すように、（ｂ）方向になる。遅延がない右（Ｒ）信号と遅延がある左（Ｌ）信号により音響用スピーカ２ａ、２ｂからの音響伝播の方向は、本図に示すように、（ｃ）方向になる。遅延がある右（Ｒ）信号と遅延がある左（Ｌ）信号により音響用スピーカ２ａ、２ｂからの音響伝播の方向は、双方の遅延量が等しい場合には、本図に示すように、（ａ）方向と一致する。

【００９４】このようにして、携帯端末装置１を中心に輪になって音響を聴取するような場合、携帯端末装置１の片面にのみ音響用スピーカが置かれていると、音響用スピーカの設置されていない側では、音響聴取が困難となることが予想されるが、本発明の信号処理により、音響伝播がより広角に広がる無指向性が実現されることにより、１台の携帯端末装置１にて音響用スピーカを増設することなく、多人数の受聴者により音響聴取が可能になる。

【００９５】なお、遅延器は音響用スピーカ２ａ、２ｂの入力側にそれぞれ１つづ設けたが、これに限らず、異なる遅延量を持つ遅延器を複数設けてもよい。これにより、さらに、なめらかな無指向性が実現できる。また、スピーカの数を増やすことで、より広角的な音響聴取が可能となる。次に、時と場合により、受聴者の人数、場所が変化するため、上記信号処理の機能が単一であると不都合を生じる場合があるので、この不都合の回避について以下に説明を行う。

【００９６】図３５は本発明に係る携帯端末装置の音響再生システムにおける第１７の実施の形態を示す概略構成を示す図である。本図に示すように、音響用スピーカ２ａ、２ｂの入力側に指向性の絞り信号処理部３１、無指向性信号処理部３２、スイッチ部３３が設けられる。指向性の絞り信号処理部３１は、図３３に示すような構成を有し、指向性を一定の方向に絞る信号処理を行う。

【００９７】無指向性信号処理部３２は、図３４に示すような構成を有し、無指向性を形成する信号処理を行う。スイッチ部３３は、指向性の絞り信号処理部３１、無指向性信号処理部３２を択一に選択する。このようにして、信号処理機能を選択可能にしたので、状況に応じて最適な信号処理を行うことが可能になると同時に、常に快適な音響聴取が可能になる。

【００９８】図３６は本発明に係る携帯端末装置の音響

再生システムにおける第１８の実施の形態を示す概略構成を示す図である。本図に示すように、図１と比較して、音響用スピーカ２ａ、２ｂは、携帯端末装置１の上部の横方向に配置され、音響用スピーカ２ａは携帯端末装置１の前面に向き、音響用スピーカ２ｂは携帯端末装置１の背面に向き、双方は、１８０度異なる向きを有する。

【００９９】図３７は図３６における携帯端末装置１の音響の伝播方向を示す図である。本図に示すように、音響聴取位置５ａ、５ｂは、音響用スピーカ２ａ、２ｂからの聴取位置であり、音響の伝播方向７ａ、７ｂは音響用スピーカ２ａ、２ｂから生じた音響の伝播方向を示す。音響用スピーカ２ａ、２ｂからは、個々に異なる音響を、例えば、２カ国語の音声が複数人で聴取される。例えば、音響用スピーカ２ａからの言語を聴取したい者は音響聴取位置５ａで、音響用スピーカ２ｂからの言語を聴取したい者は音響聴取位置５ｂで聴取することにより、１台の携帯端末装置１で複数の言語を同時に聴取することが可能になる。

【０１００】また、このように携帯端末装置１の両面に音響用スピーカ２ａ、２ｂを設置することで音響を無指向性とする効果も得られ、携帯端末装置１を中心に輪になって音響を聴取する場合、１台の携帯端末装置１にて多数人での音響聴取が可能になる。例えば、外出先でこのような状態で音響を聴取する場合、携帯端末装置１が１台あれば可能となるため、他の外付けスピーカなどを併せて持参する必要がなくなり荷物の低減が可能となるとともに、携帯端末装置１は基本的に外出時に常に携帯されるものであるため、持参し忘れるといった事態も回避できる。

【０１０１】図３８は本発明に係る携帯端末装置の音響再生システムにおける第１９の実施の形態を示す概略構成を示す図である。本図に示すように、図１と比較して、携帯端末装置１には音響用スピーカ２と、通話マイクロフォン兼用の音響用スピーカ４２とが設けられる。このように、音響用スピーカと通話マイクロフォンとを兼用することで、携帯端末装置１の部品点数が低減され、小型軽量化が実現できる。

【０１０２】図３９は図３８における第１９の実施の形態に関する第１の変形例を示す図である。本図に示すように、携帯端末装置１には音響用スピーカ２と、受話スピーカ兼用の音響用スピーカ４３とが設けられる。このように、音響用スピーカと受話スピーカとを兼用することで、携帯端末装置１の部品点数が低減され、小型軽量化が実現できる。

【０１０３】図４０は図３８における第１９の実施の形態に関する第２の変形例を示す図である。本図に示すように、携帯端末装置１には通話マイクロフォン兼用の音響用スピーカ４２と、受話スピーカ兼用の音響用スピーカ４３とが設けられる。このように、音響用スピーカをそれぞれ通話マイクロフォン、受話スピーカと兼用することで、携帯端末装置１の部品点数が低減され、小型軽量化が実現できる。

【０１０４】図４１は図３８における第１９の実施の形態に関する第３の変形例を示す図である。本図に示すように、携帯端末装置１には音響用スピーカ２と、着信音を鳴らすリンガ兼用の音響用スピーカ４４とが設けられる。このように、音響用スピーカとリンガとを兼用することで、携帯端末装置１の部品点数が低減され、小型軽量化が実現できる。

【０１０５】図４２は図３８における第１９の実施の形態に関する第４の変形例を示す図である。本図に示すように、携帯端末装置１には音響用スピーカ２と、着信音を鳴らすバイブレータ兼用の音響用スピーカ４５とが設けられる。このように、音響用スピーカとバイブレータとを兼用することで、携帯端末装置１の部品点数が低減され、小型軽量化が実現できる。

【０１０６】図４３は図３８における第１９の実施の形態に関する第５の変形例を示す図である。本図に示すように、携帯端末装置１には音響用スピーカ２と、画面表示モニタ兼用の音響用スピーカ４６とが設けられる。このように、音響用スピーカと画面表示モニタとを兼用することで、携帯端末装置１の部品点数が低減され、小型軽量化が実現できる。

【０１０７】図４４は図３８における第１９の実施の形態に関する第６の変形例を示す図である。本図に示すように、携帯端末装置１には音響用スピーカ２と、キーパネル兼用の音響用スピーカ４７とが設けられる。このように、音響用スピーカとキーパネルと兼用することで、携帯端末装置１の部品点数が低減され、小型軽量化が実現できる。

【０１０８】以上の説明で再生される音響データが、携帯端末装置１に内蔵される内蔵メモリ、媒体などに記憶されているものを再生したり、又はダウンロードサイト、パーソナルコンピュータ（ＰＣ）などの外部ソースからの受信と同時に記憶されている音響データが再生されるように取り扱われることにより、携帯端末装置１は音源と音響スピーカ双方を兼ね備えた構造となっている。これでは音響データが限られるので、以下のようにして、音響データの入手範囲の拡大を図る。

【０１０９】図４５は本発明に係る携帯端末装置の音響再生システムにおける第２０の実施の形態を示す概略構成を示す図である。本図に示すように、図４０と比較して、携帯端末装置１には信号入力端子５０が設けられ、信号入力端子５０にはデータ受信ケーブル５１を介して音響信号発生装置５２が接続される。音響信号発生装置５２はパーソナルコンピュータ、デッキ等からなる。

【０１１０】本発明によれば、携帯端末装置１を外付け音響用スピーカのように機能させ、他の音源からの音響を再生する機能を付加することにより、より多くの音響

データに対応可能になる。さらに、第２０の実施の形態に関する第１の変形例として、携帯端末装置１を複数の音響信号発生装置５２に接続させ、入力音源の取得先をスイッチで切り換える。これにより、複数の音源からの音響が容易に比較できるなど、利便性が向上する。

【０１１１】さらに、第２０の実施の形態に関する第２の変形例として、外部からの入力信号を再生する場合、通話マイクロフォン兼用の音響用スピーカ４２、受話スピーカ兼用の音響用スピーカ４３をアンプレス駆動可能なスピーカとすることにより、携帯端末装置１自体の電源を切った状態での音響再生が可能になる。これにより、携帯端末装置１が節電され、１回の充電に対する使用可能時間が増加し、バッテリーの残量にとらわれることなく、高音質の音響再生が可能になる。また、これは、通話マイクロフォンや受話スピーカ兼用ではない音響スピーカの場合でも、同様の効果が得られる。さらに、第２０の実施の形態に関する第３の変形例として、携帯端末装置１は音響信号発生装置５２から無線、例えば、ｂｌｕｅｔｏｏｔｈなどで音響データを得る。ケーブルが使用されないので、システムの構成が簡素化できる。

【０１１２】図４６は本発明に係る携帯端末装置の音響再生システムにおける第２１の実施の形態を示す概略構成を示す図である。本図に示すように、図４０と比較して、携帯端末装置１にはヘッドホン装着端子５３が設けられ、ヘッドホン装着端子５３にはデータ受信ケーブル５１を介してヘッドホン５４が接続される。

【０１１３】このようにして、公共の交通機関、図書館など、周囲に音を漏らせないような場合にはヘッドホン５４にてステレオ音響の聴取が可能である。さらに、第２１の実施の形態に関する第１の変形例として、公共の交通機関などで音響が第３者に聞こえることが好ましくないような場合には、再生音響が携帯端末装置１の受話スピーカから再生されると共に、通話音声と同時に送信し通話相手の受話スピーカから再生されるような構成にする。

【０１１４】これにより、周囲の多大な迷惑とならずに、心地よいＢＧＭを伴った会話が実現できる。また、本ＢＧＭに駅の騒音、雑踏、デパート、居酒屋の喧騒など選択することにより、より会話を弾ませることが可能になる。

【０１１５】

【発明の効果】以上説明したように、本発明によれば、携帯端末装置に複数の音響用スピーカが設けられ、前記少なくとも２つの音響用スピーカは互いの再生音響を補助し合ながら同時に駆動されるので、ヘッドホン、イヤホン、外付けスピーカシステムなどを使用することなく、単体で、快適、高音質な音響再生が可能で、使用環境への高適応性、高利便性を有する携帯端末装置の実現が可能になった。

【図面の簡単な説明】

【図１】本発明に係る携帯端末装置の音響再生システムにおける第１の実施の形態を示す概略構成を示す図である。

【図２】図１の音響用スピーカ２ａ、２ｂのステレオ音響再生を説明する図である。

【図３】本発明に係る携帯端末装置の音響再生システムにおける第２の実施の形態を示す概略構成を示す図である。

【図４】本発明に係る携帯端末装置の音響再生システムにおける第３の実施の形態を示す概略構成を示す図である。

【図５】図４におけるＢａ－Ｂａ’又はＢｂ－Ｂｂ’断面図である。

【図６】本発明に係る携帯端末装置の音響再生システムにおける第４の実施の形態を示す概略構成を示す図である。

【図７】図６におけるＢ－Ｂ’断面図である。

【図８】図６、図７における音響用スピーカ２ａ、２ｂのクロストークの低減を説明する図である。

【図９】本発明に係る携帯端末装置の音響再生システムにおける第５の実施の形態を示す概略構成を示す図である。

【図１０】本発明に係る携帯端末装置の音響再生システムにおける第６の実施の形態を示す概略構成を示す図である。

【図１１】本発明に係る携帯端末装置の音響再生システムにおける第７の実施の形態を示す概略構成を示す図である。

【図１２】図１１における音響用スピーカ２ａ、２ｂを含むＡ－Ａ’断面を矢印方向から見た概略構成図である。

【図１３】図１１、図１２における音響用スピーカ２ａ、２ｂのクロストークの低減を説明する図である。

【図１４】図１１における第７の実施の形態に関する概略構成の第２の変形例を示す図である。

【図１５】図１１における第７の実施の形態に関する概略構成の第３の変形例を示す図である。

【図１６】本発明に係る携帯端末装置の音響再生システムにおける第８の実施の形態を示す概略構成を示す図である。

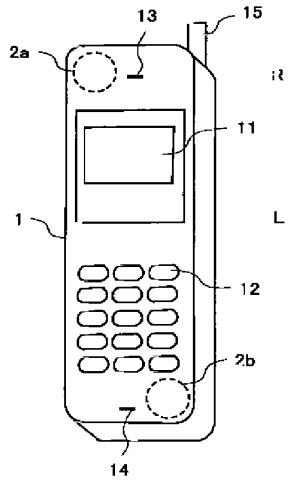
【図１７】本発明に係る携帯端末装置の音響再生システムにおける第９の実施の形態を示す概略構成を示す図である。

【図１８】本発明に係る携帯端末装置の音響再生システムにおける第１０の実施の形態を示す概略構成を示す図である。

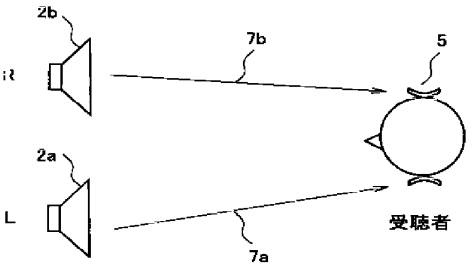
【図１９】本発明に係る携帯端末装置の音響再生システムにおける第１１の実施の形態を示す概略構成を示す図である。

【図２０】図１９における音響用スピーカ２ａ、２ｂを含むＡ－Ａ’断面を矢印方向から見た概略構成図である。
【図２１】クロストーク削除の信号処理を行う回路の概略を示す図である。
【図２２】図２１のクロストークの削除動作を説明する図である。
【図２３】図２０における第１１の実施の形態に関する第１の変形例を示す図である。
【図２４】図２０における第１１の実施の形態に関する第２の変形例を示す図である。
【図２５】本発明に係る携帯端末装置の音響再生システムにおける第１２の実施の形態を示す概略構成を示す図である。
【図２６】図２５における音響用スピーカ２ａ、２ｂを含むＡ－Ａ’断面を矢印方向から見た概略構成図である。
【図２７】本発明に係る携帯端末装置の音響再生システムにおける第１３の実施の形態を示す概略構成を示す図である。
【図２８】図２７における携帯端末装置の側面図である。
【図２９】本発明に係る携帯端末装置の音響再生システムにおける第１４の実施の形態を示す概略構成を示す図である。
【図３０】図２９の音響スピーカアレイ２ｓの指向性を示す図である。
【図３１】本発明に係る携帯端末装置の音響再生システムにおける第１５の実施の形態を示す概略構成を示す図である。
【図３２】本発明に係る携帯端末装置の音響再生システムにおける第１６の実施の形態を示す概略構成を示す図である。
【図３３】図３２の音響用スピーカ２ａ、２ｂの指向性を絞る信号処理の回路例を説明する図である。
【図３４】図３２における第１６の実施の形態に関する第１の変形例であり、音響用スピーカ２ａ、２ｂの指向性を無指向性にする信号処理例を説明する図である。
【図３５】本発明に係る携帯端末装置の音響再生システムにおける第１７の実施の形態を示す概略構成を示す図である。
【図３６】本発明に係る携帯端末装置の音響再生システムにおける第１８の実施の形態を示す概略構成を示す図である。
【図３７】図３６における携帯端末装置１の音響の伝播方向を示す図である。
【図３８】本発明に係る携帯端末装置の音響再生システムにおける第１９の実施の形態を示す概略構成を示す図である。
【図３９】図３８における第１９の実施の形態に関する第１の変形例を示す図である。
【図４０】図３８における第１９の実施の形態に関する第２の変形例を示す図である。
【図４１】図３８における第１９の実施の形態に関する第３の変形例を示す図である。
【図４２】図３８における第１９の実施の形態に関する第４の変形例を示す図である。
【図４３】図３８における第１９の実施の形態に関する第５の変形例を示す図である。
【図４４】図３８における第１９の実施の形態に関する第６の変形例を示す図である。
【図４５】本発明に係る携帯端末装置の音響再生システムにおける第２０の実施の形態を示す概略構成を示す図である。
【図４６】本発明に係る携帯端末装置の音響再生システムにおける第２１の実施の形態を示す概略構成を示す図である。
【符号の説明】
１…携帯端末装置
２、２ａ、２ｂ、２ｃ、２ｄ…音響用スピーカ
２ｓ…音響スピーカアレイ
５、５ａ、５ｂ…音響聴取位置
６…筐体壁位置
６’…筐体壁の多孔部
７、７ａ、７ｂ、７ａＲ、７ａＬ、７ｂＲ、７ｂＬ…伝播方向
８、８’…クロストーク防止壁
１１…画面表示モニタ
１２…キーパネル
１３…受話口
１４…送話口
１５…アンテナ
２０ａ、２０ｂ…逆フィルタ
２２、２４ａ、２４ｂ…遅延器
２３…減衰器
３１…指向性の絞り信号処理部
３２…無指向性信号処理部
３３…スイッチ部
４２…通話マイクロフォン兼用の音響用スピーカ
４３…受話スピーカ兼用の音響用スピーカ
４４…リンガ兼用の音響用スピーカ
４５…バイブレータ兼用の音響用スピーカ
４６…画面表示モニタ兼用の音響用スピーカ
４７…キーパネル兼用の音響用スピーカ
５０…信号入力端子
５１…データ受信ケーブル
５２…音響信号発生装置
５３…ヘッドホン装着端子
５４…ヘッドホン

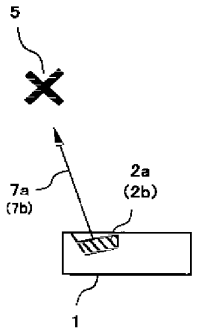
【図1】



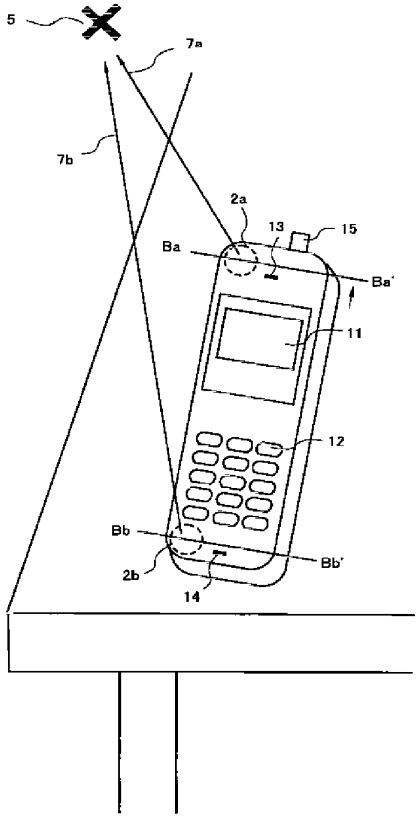

【図2】



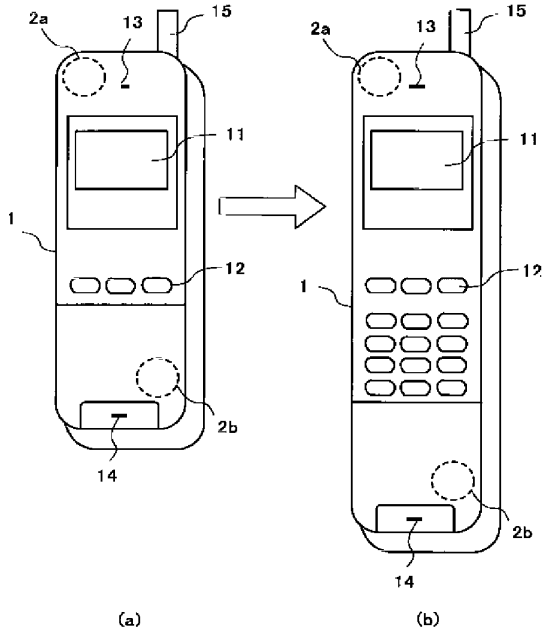

【図5】



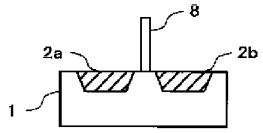

【図4】



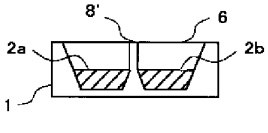

【図3】



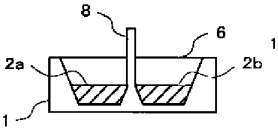

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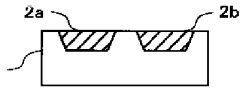

【図14】



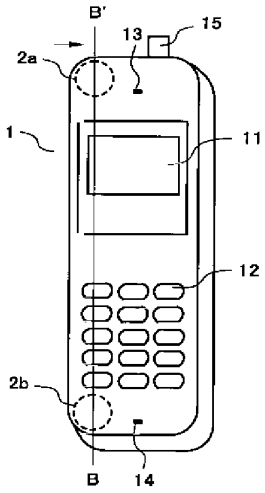

【図15】



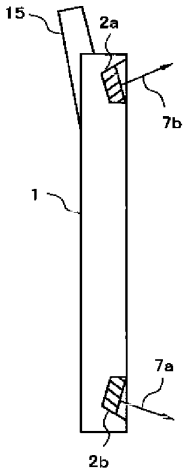

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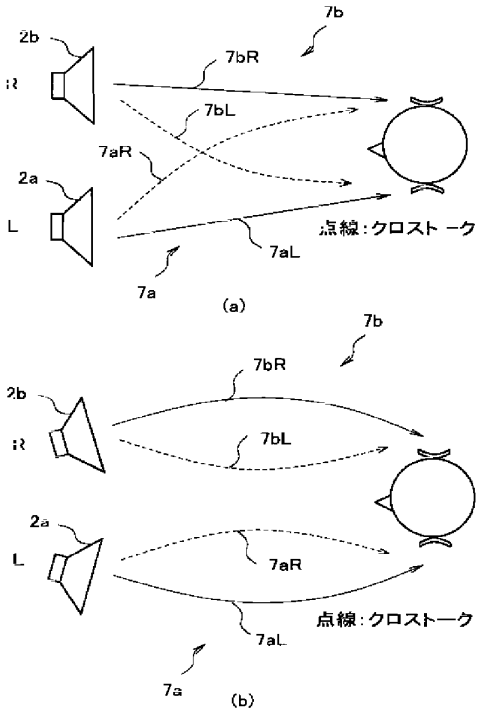
【図６】



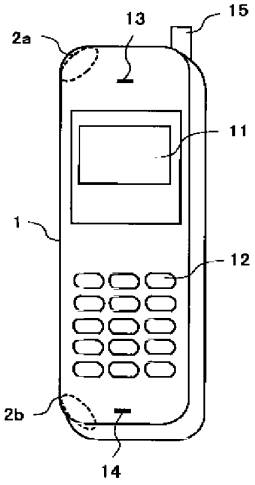

【図７】



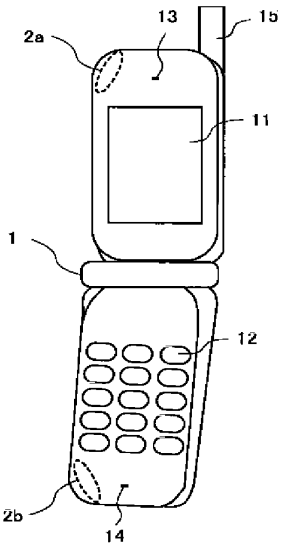

【図８】



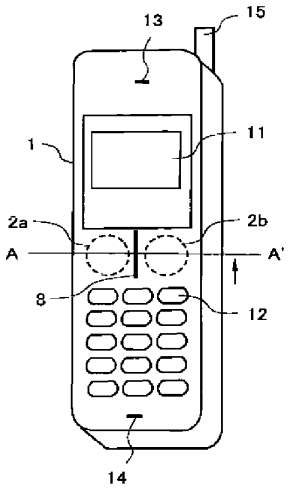

【図９】



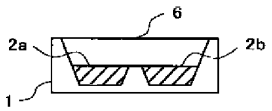

【図１０】



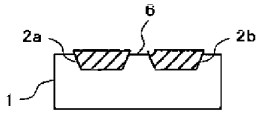

【図１１】



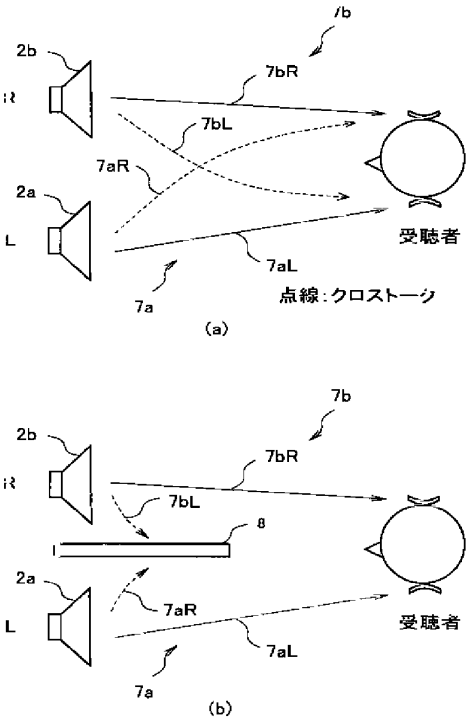

【図２３】



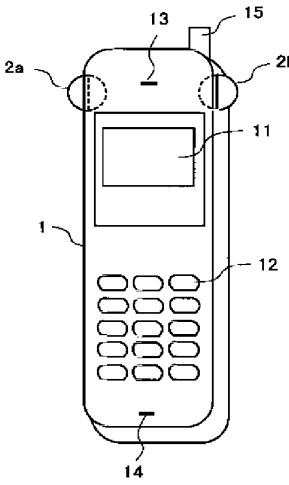

【図２４】



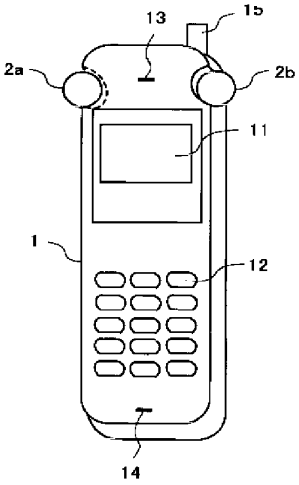
【図13】



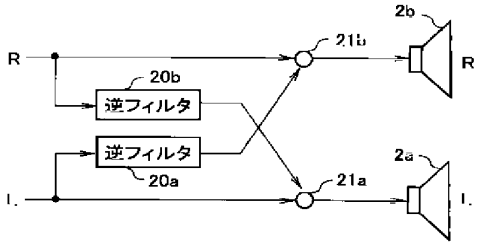

【図16】



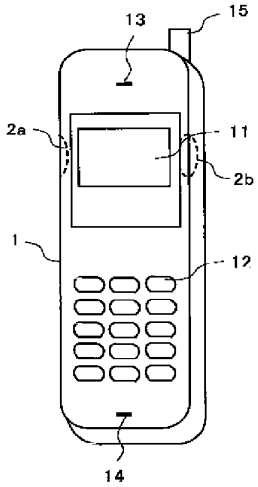

【図17】



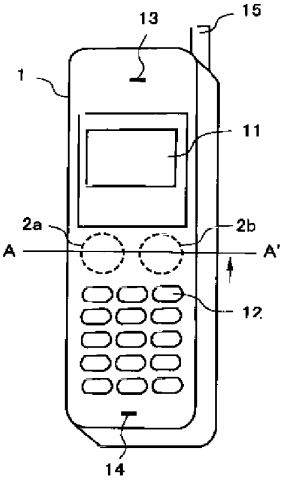

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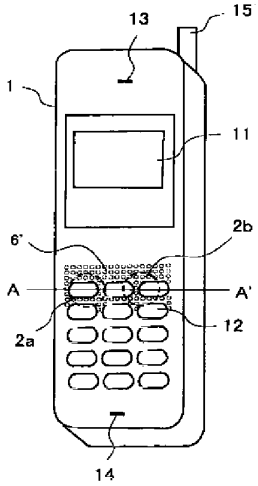

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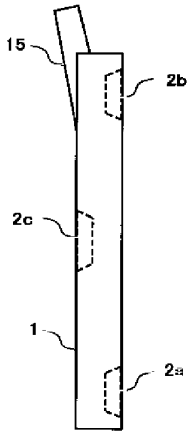

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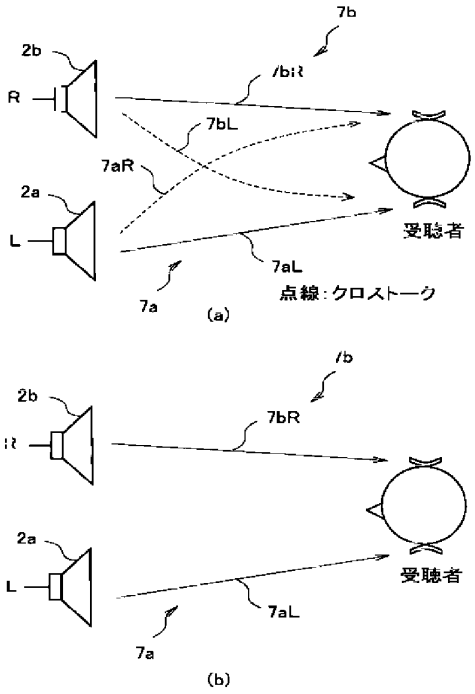

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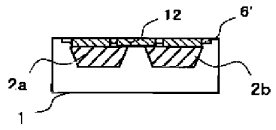

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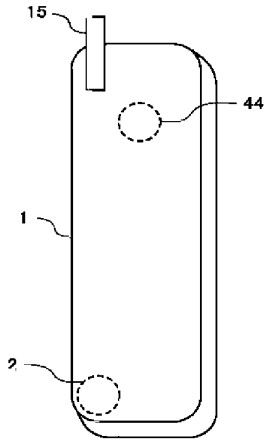
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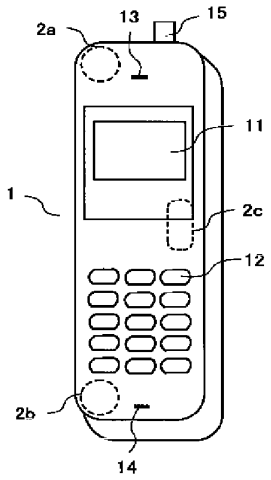

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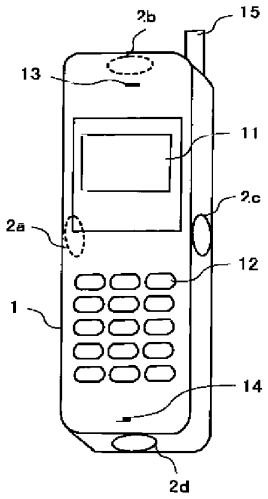

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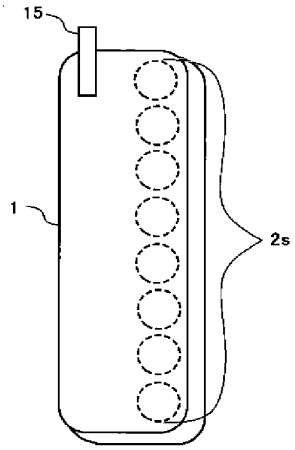

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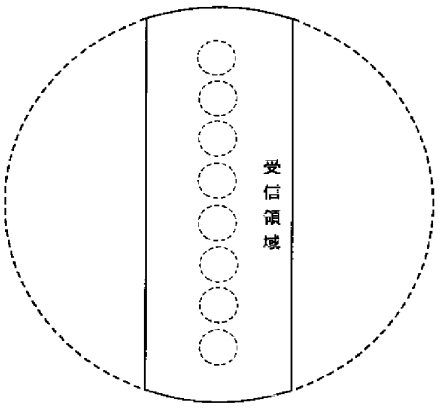

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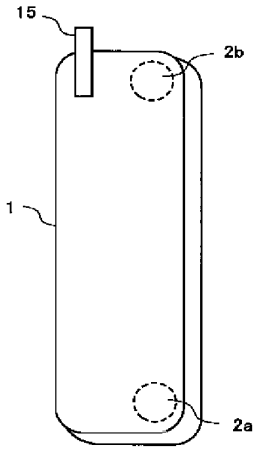

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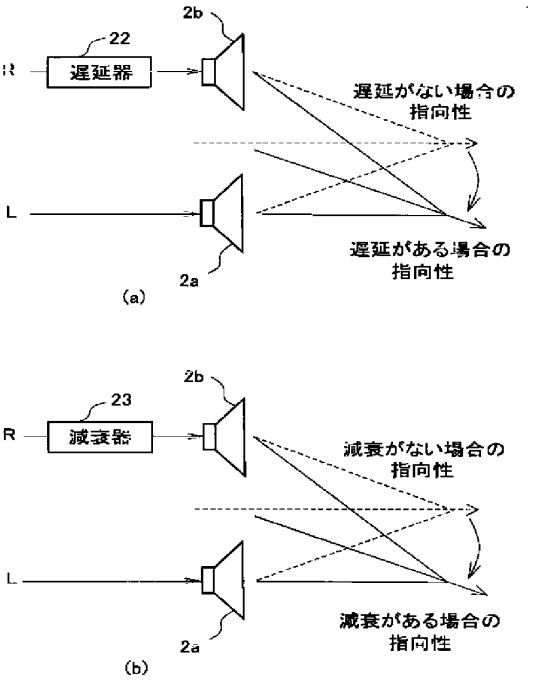

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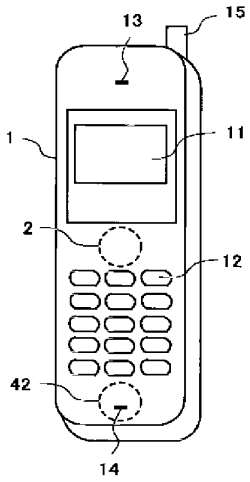
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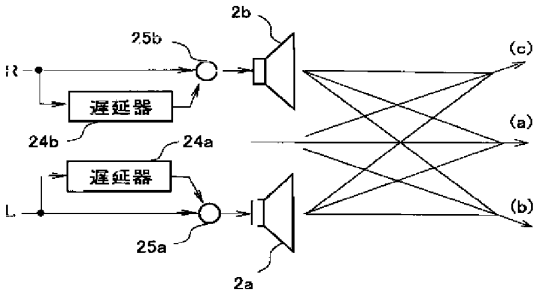

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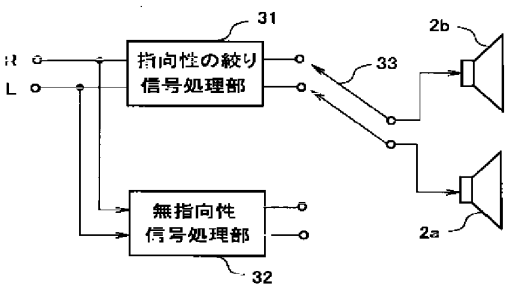

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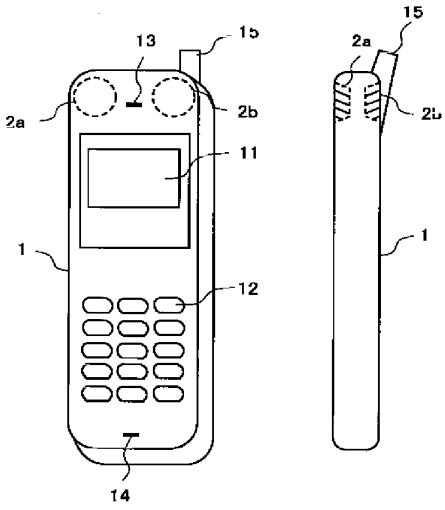

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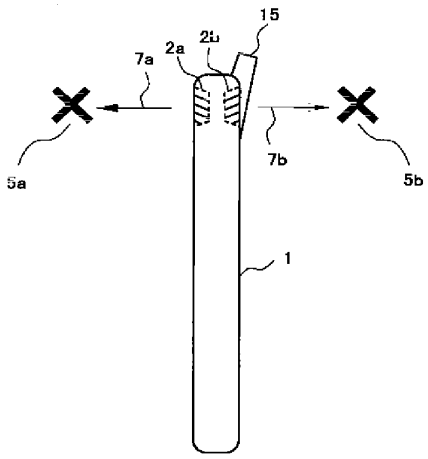

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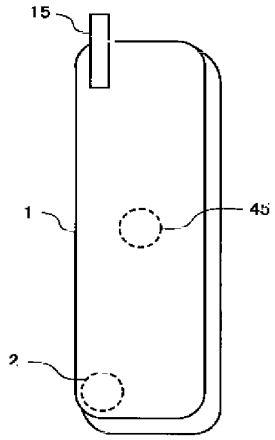
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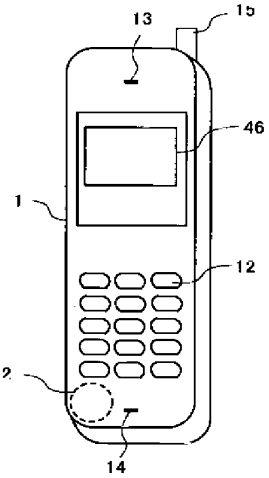

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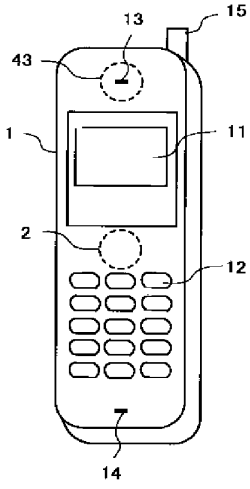

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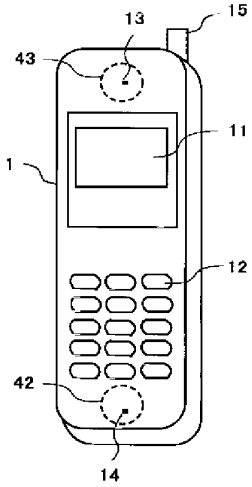

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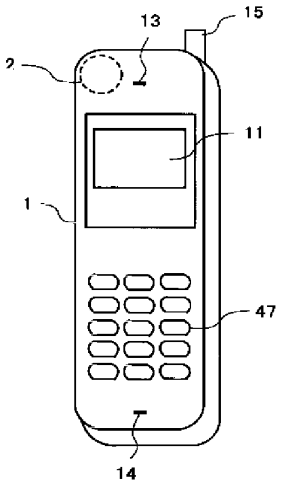

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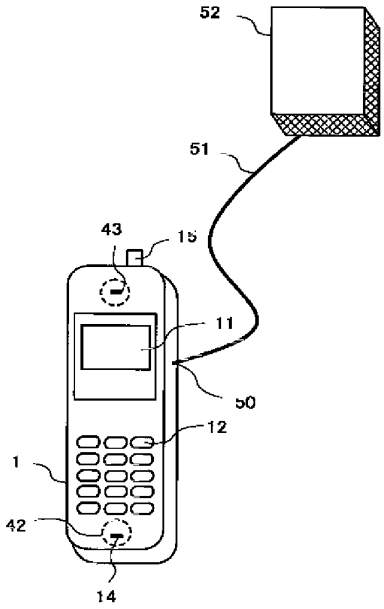

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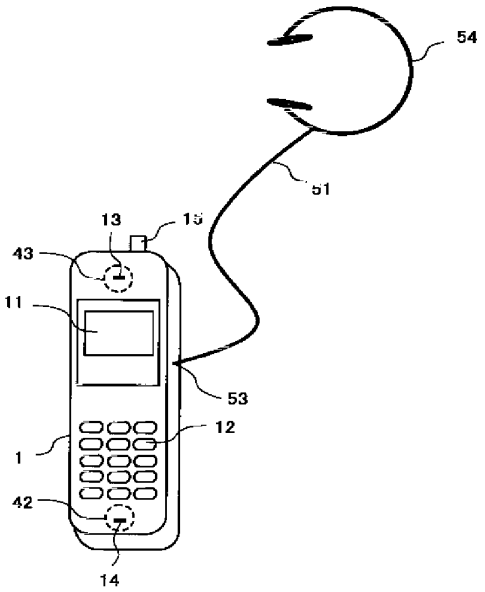
【図44】




【図45】




【図46】




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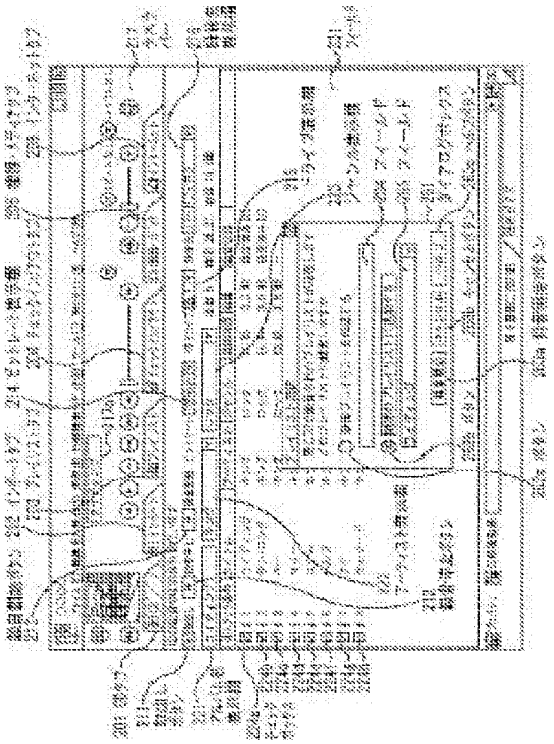
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**Abstract of JP2002123267 (A)**

PROBLEM TO BE SOLVED: To search and to display contents recorded in the past. SOLUTION: A play list recorded in the past is searched, and the play list is displayed when it exists. About the contents recorded in the past, for example, 'recorded' is displayed such as contents corresponding to CD track numbers 1, 2, and 5. Furthermore, when the contents are recorded twice in the past, the number of times of the sound recording are displayed as [2] such as the contents corresponding to the CD track numbers 1, 2, and 5. Furthermore, when the play list exists, a dialog box 261 showing a play list selection is displayed, and then a user can select add-recording on the basis of the play list in the past or recording on the basis of a newly prepared play list.



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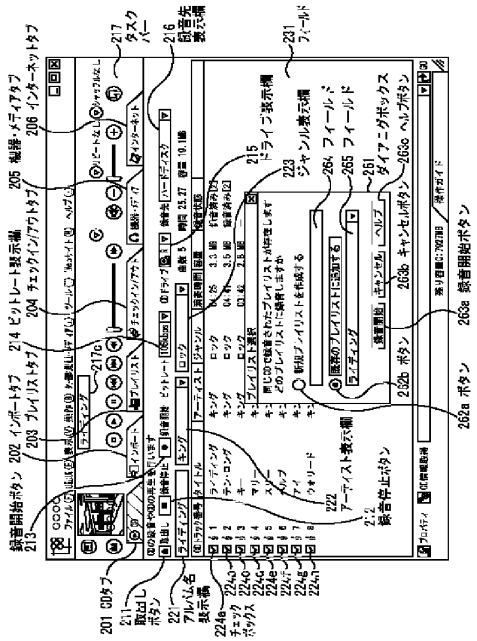
(22)出願日　平成12年10月12日(2000.10.12)

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最終頁に続く

(54)【発明の名称】　情報処理装置および方法、並びにプログラム格納媒体

(57)【要約】
【課題】　過去に録音したコンテンツを検索し、表示させる。
【解決手段】　過去に録音されたプレイリストが検索され、存在するとそのプレイリストが表示される。また、過去に録音されているコンテンツについては、例えば、ＣＤトラック番号１，２，５に対応するコンテンツのように「録音済み」が表示され、さらに、例えば、過去に２回録音されている場合、ＣＤトラック番号１，２，５に対応するコンテンツのように［２］、録音回数が表示される。さらに、プレイリストが存在する場合には、プレイリスト選択をしめすダイアログボックス２６１が表示され、使用者は、過去のプレイリストに追加して録音するか、新たなプレイリストを作成して録音するかを選択することができる。



【特許請求の範囲】
【請求項１】　第1の記録媒体に記録されたコンテンツを、第２の記録媒体に記録する機能を有する情報処理装置において、
前記第１の記録媒体に記録された前記コンテンツを第２の記録媒体に記録する記録手段と、
前記記録手段により、前記第１の記録媒体に記録された前記コンテンツが、第２の記録媒体に記録されるとき、前記コンテンツの情報を記録履歴情報として記憶する記録履歴情報記憶手段と、
前記記録手段により、前記第１の記録媒体に記録された前記コンテンツが、第２の記録媒体に再び記録されるとき、前記記録履歴情報記憶手段により前記記録履歴情報として記憶された前記コンテンツの情報を検索し、表示する表示手段とを備えることを特徴とする情報処理装置。
【請求項２】　前記記録履歴情報は、前記第１の記録媒体のトラック毎の録音回数を記録した録音履歴情報、前記コンテンツのタイトル保存情報、および、プレイリスト情報を含むことを特徴とする請求項１に記載の情報処理装置。
【請求項３】　第1の記録媒体に記録されたコンテンツを、第２の記録媒体に記録する機能を有する情報処理装置の情報処理方法において、
前記第１の記録媒体に記録された前記コンテンツを第２の記録媒体に記録する記録ステップと、
前記記録ステップの処理で、前記第１の記録媒体に記録された前記コンテンツが、第２の記録媒体に記録されるとき、前記コンテンツの情報を記録履歴情報として記憶する記録履歴情報記憶ステップと、
前記記録ステップの処理で、前記第１の記録媒体に記録された前記コンテンツが、第２の記録媒体に再び記録されるとき、前記記録履歴情報記憶ステップの処理で前記記録履歴情報として記憶された前記コンテンツの情報を検索し、表示する表示ステップとを含むことを特徴とする情報処理方法。
【請求項４】　第1の記録媒体に記録されたコンテンツを、第２の記録媒体に記録する機能を有する情報処理装置を制御するプログラムであって、
前記第１の記録媒体に記録された前記コンテンツの第２の記録媒体への記録を制御する記録制御ステップと、
前記記録制御ステップの処理で、前記第１の記録媒体に記録された前記コンテンツが、第２の記録媒体に記録されるとき、前記コンテンツの情報の記録履歴情報としての記憶を制御する記録履歴情報記憶制御ステップと、
前記記録制御ステップの処理で、前記第１の記録媒体に記録された前記コンテンツが、第２の記録媒体に再び記録されるとき、前記記録履歴情報記憶制御ステップの処理で前記記録履歴情報として記憶された前記コンテンツの情報の検索と、表示を制御する表示制御ステップとを含むことを特徴とするコンピュータが読み取り可能なプログラムが記録されているプログラム格納媒体。
【発明の詳細な説明】
【０００１】
【発明の属する技術分野】本発明は、情報処理装置および方法、並びにプログラム格納媒体に関し、特に、第１の記録媒体に記憶されたコンテンツを第２の記録媒体に記録するとき、既に第２の記録媒体に記録されている、第１の記録媒体に記憶されたコンテンツの情報を検索して表示するようにした情報処理装置および方法、並びにプログラム格納媒体に関する。
【０００２】
【従来の技術】パーソナルコンピュータなどの情報処理装置は、ＣＤ（Compact Disc）などから音楽データなどのコンテンツを読み出して、読み出したコンテンツをハードディスクなどの記録媒体に記録する（録音する）ことができる。
【０００３】
【発明が解決しようとする課題】しかしながら、既に記録媒体に記録されているコンテンツを、例えば、ビットレートなどを変えて、再び、ＣＤから読み出して記録しようとする場合、既に、記録されているコンテンツが何回記録されているのかを調べるには、記録媒体に記録されたコンテンツの一覧表を表示させて、コンテンツ１個１個を使用者が自ら検索しなければならず、例えば、既に、数千という数のコンテンツが記録されているような場合、その検索作業は非常に手間のかかるものとなってしまうという課題があった。また、既に、記録されている音楽データを検索せずに、再びコンテンツを記録する場合、アーティスト名、アルバム名、および、タイトル名といったコンテンツの情報は、最初から編集し直さなければならないうえ、例えば、同じビットレートの全く同じコンテンツを録音してしまう恐れがあり、その場合、ハードディスクの容量を無駄にしてしまうという課題があった。
【０００４】本発明はこのような状況に鑑みてなされたものであり、記録媒体に音楽データなどのコンテンツを記録する際に、既に記録されたコンテンツの情報を検索して、表示させるようにするものである。
【０００５】
【課題を解決するための手段】本発明の情報処理装置は、第１の記録媒体に記録されたコンテンツを第２の記録媒体に記録する記録手段と、記録手段により、第１の記録媒体に記録されたコンテンツが、第２の記録媒体に記録されるとき、コンテンツの情報を記録履歴情報として記憶する記録履歴情報記憶手段と、記録手段により、第１の記録媒体に記録されたコンテンツが、第２の記録媒体に再び記録されるとき、記録履歴情報記憶手段により記録履歴情報として記憶されたコンテンツの情報を検索し、表示する表示手段とを備えることを特徴とする。

【０００６】前記記録履歴情報には、第１の記録媒体のトラック毎の録音回数を記録した録音履歴情報、コンテンツのタイトル保存情報、および、プレイリスト情報を含ませるようにすることができる。

【０００７】本発明の情報処理方法は、第１の記録媒体に記録されたコンテンツを第２の記録媒体に記録する記録ステップと、記録ステップの処理で、第１の記録媒体に記録されたコンテンツが、第２の記録媒体に記録されるとき、コンテンツの情報を記録履歴情報として記憶する記録履歴情報記憶ステップと、記録ステップの処理で、第１の記録媒体に記録されたコンテンツが、第２の記録媒体に再び記録されるとき、記録履歴情報記憶ステップの処理で記録履歴情報として記憶されたコンテンツの情報を検索し、表示する表示ステップとを含むことを特徴とする。

【０００８】本発明のプログラム格納媒体のプログラムは、第１の記録媒体に記録されたコンテンツの第２の記録媒体への記録を制御する記録制御ステップと、記録制御ステップの処理で、第１の記録媒体に記録されたコンテンツが、第２の記録媒体に記録されるとき、コンテンツの情報の記録履歴情報としての記憶を制御する記録履歴情報記憶制御ステップと、記録制御ステップの処理で、第１の記録媒体に記録されたコンテンツが、第２の記録媒体に再び記録されるとき、記録履歴情報記憶制御ステップの処理で記録履歴情報として記憶されたコンテンツの情報の検索と、表示を制御する表示制御ステップとを含むことを特徴とする。

【０００９】本発明の情報処理装置および方法、並びに、プログラム格納媒体においては、第１の記録媒体に記録されたコンテンツが第２の記録媒体に記録され、第１の記録媒体に記録されたコンテンツが、第２の記録媒体に記録されるとき、コンテンツの情報が記録履歴情報として記憶され、第１の記録媒体に記録されたコンテンツが、第２の記録媒体に再び記録されるとき、記録履歴情報として記憶されたコンテンツの情報が検索され、表示される。

【００１０】

【発明の実施の形態】図１は、本発明に係るコンテンツデータ管理システムの一実施の形態を示す図である。パーソナルコンピュータ１は、ローカルエリアネットワークまたはインターネットなどから構成されるネットワーク２に接続されている。パーソナルコンピュータ１は、EMD（Electrical Music Distribution）サーバ３から受信した、またはCD（Compact Disc）から読み取った楽音のデータ（以下、コンテンツと称する）を、そのまま記録するか、または所定の圧縮の方式（例えば、ATRAC3（商標））に変換するとともにDES（Data Encryption Standard）などの暗号化方式で暗号化して記録する。

【００１１】パーソナルコンピュータ１は、暗号化して記録しているコンテンツに対応して、コンテンツの利用条件を示す権利情報を記録する。

【００１２】権利情報は、例えば、その権利情報に対応するコンテンツを同時に利用することができるポータブルデバイス（Portable Device（PDとも称する））の台数（後述する、いわゆるチェックアウトできるPDの台数）を示す。権利情報に示される数だけコンテンツをチェックアウトしたときでも、パーソナルコンピュータ１は、そのコンテンツを再生できる。

【００１３】または、権利情報は、コピーすることができることを示す。コンテンツをポータブルデバイス５－１乃至５－３にコピーしたとき、パーソナルコンピュータ１は記録しているコンテンツを再生できる。コンテンツの、ポータブルデバイス５－１乃至５－３に記憶させることができる回数は、制限される場合がある。この場合、コピーできる回数は、増えることがない。

【００１４】または、権利情報は、他のパーソナルコンピュータに移動することができるか否かなどを示す。ポータブルデバイス５－１乃至５－３にコンテンツを移動させた後、パーソナルコンピュータ１が記録しているコンテンツは使用できなくなる（コンテンツが削除されるか、または利用条件が変更されて使用できなくなる）。

【００１５】パーソナルコンピュータ１は、暗号化して記録しているコンテンツを、コンテンツに関連するデータ（例えば、曲名、または再生条件など）と共に、USB（Universal Serial Bus）ケーブルを介して、接続されているポータブルデバイス５－１に記憶させるとともに、ポータブルデバイス５－１に記憶させたことに対応して、記憶させたコンテンツに対応する権利情報を更新する（以下、チェックアウトと称する）。より詳細には、チェックアウトしたとき、パーソナルコンピュータ１が記録している、そのコンテンツに対応する権利情報のチェックアウトできる回数は、１減らされる。チェックアウトできる回数が０のとき、対応するコンテンツは、チェックアウトすることができない。

【００１６】パーソナルコンピュータ１は、暗号化して記録しているコンテンツを、コンテンツに関連するデータと共に、USBケーブルを介して、接続されているポータブルデバイス５－２に記憶させるとともに、ポータブルデバイス５－２に記憶させたことに対応して、記憶させたコンテンツに対応する権利情報を更新する。パーソナルコンピュータ１は、暗号化して記録しているコンテンツを、コンテンツに関連するデータと共に、USBケーブルを介して、接続されているポータブルデバイス５－３に記憶させるとともに、ポータブルデバイス５－３に記憶させたことに対応して、記憶させたコンテンツに対応する権利情報を更新する。

【００１７】また、パーソナルコンピュータ１は、USBケーブルを介して、接続されているポータブルデバイス５－１にパーソナルコンピュータ１がチェックアウトしたコンテンツを、ポータブルデバイス５－１に消去させ

て（または、使用できなくさせて）、消去させたコンテンツに対応する権利情報を更新する（以下、チェックインと称する）。より詳細には、チェックインしたとき、パーソナルコンピュータ１が記録している、対応するコンテンツの権利情報のチェックアウトできる回数は、１増やされる。

【００１８】パーソナルコンピュータ１は、USBケーブルを介して、接続されているポータブルデバイス５－２にパーソナルコンピュータ１がチェックアウトしたコンテンツを、ポータブルデバイス５－２に消去させて（または、使用できなくさせて）、消去させたコンテンツに対応する権利情報を更新する。パーソナルコンピュータ１は、USBケーブルを介して、接続されているポータブルデバイス５－３にパーソナルコンピュータ１がチェックアウトしたコンテンツを、ポータブルデバイス５－３に消去させて（または、使用できなくさせて）、消去させたコンテンツに対応する権利情報を更新する。

【００１９】パーソナルコンピュータ１は、図示せぬ他のパーソナルコンピュータがポータブルデバイス５－１にチェックアウトしたコンテンツをチェックインできない。パーソナルコンピュータ１は、他のパーソナルコンピュータがポータブルデバイス５－２にチェックアウトしたコンテンツをチェックインできない。パーソナルコンピュータ１は、他のパーソナルコンピュータがポータブルデバイス５－３にチェックアウトしたコンテンツをチェックインできない。

【００２０】EMDサーバ３は、パーソナルコンピュータ１の要求に対応して、ネットワーク２を介して、コンテンツに関連するデータ（例えば、曲名（以下、タイトルとも称する）、または再生制限など）と共に、パーソナルコンピュータ１にコンテンツを供給する。

【００２１】EMDサーバ３が供給するコンテンツは、所定の符号化の方式で符号化され、所定の暗号化の方式で暗号化されている。

【００２２】WWW（World WIDe Web）サーバ４は、パーソナルコンピュータ１の要求に対応して、ネットワーク２を介して、コンテンツを読み取ったCDに対応するデータ（例えば、CDのアルバム名、またはCDの販売会社など）、およびCDから読み取ったコンテンツに対応するデータ（例えば、曲名、または作曲者名（以下、アーティスト名とも称する）など）をパーソナルコンピュータ１に供給する。

【００２３】ポータブルデバイス５－１は、パーソナルコンピュータ１から供給されたコンテンツ（すなわち、チェックアウトされたコンテンツ）を、コンテンツに関連するデータ（例えば、曲名、または再生制限など）と共に記憶する。ポータブルデバイス５－１は、コンテンツに関連するデータに基づいて、記憶しているコンテンツを再生し、図示せぬヘッドフォンなどに出力する。

【００２４】例えば、コンテンツに関連するデータとして記憶されている、再生制限としての再生回数を超えて再生しようとしたとき、ポータブルデバイス５－１は、対応するコンテンツの再生を停止する。コンテンツに関連するデータとして記憶されている再生制限としての、再生期限を過ぎた後に再生しようとしたとき、ポータブルデバイス５－１は、対応するコンテンツの再生を停止する。

【００２５】使用者は、コンテンツを記憶したポータブルデバイス５－１をパーソナルコンピュータ１から取り外して、持ち歩き、記憶しているコンテンツを再生させて、コンテンツに対応する音楽などを、図示せぬヘッドフォンなどで聴くことができる。

【００２６】ポータブルデバイス５－２は、パーソナルコンピュータ１から供給されたコンテンツを、コンテンツに関連するデータと共に記憶する。ポータブルデバイス５－２は、コンテンツに関連するデータに基づいて、記憶しているコンテンツを再生し、図示せぬヘッドフォンなどに出力する。使用者は、コンテンツを記憶したポータブルデバイス５－２をパーソナルコンピュータ１から取り外して、持ち歩き、記憶しているコンテンツを再生させて、コンテンツに対応する音楽などを、図示せぬヘッドフォンなどで聴くことができる。

【００２７】ポータブルデバイス５－３は、パーソナルコンピュータ１から供給されたコンテンツを、コンテンツに関連するデータと共に記憶する。ポータブルデバイス５－３は、コンテンツに関連するデータに基づいて、記憶しているコンテンツを再生し、図示せぬヘッドフォンなどに出力する。使用者は、コンテンツを記憶したポータブルデバイス５－３をパーソナルコンピュータ１から取り外して、持ち歩き、記憶しているコンテンツを再生させて、コンテンツに対応する音楽などをヘッドフォンなどで聴くことができる。

【００２８】以下、ポータブルデバイス５－１乃至５－３を個々に区別する必要がないとき、単にポータブルデバイス５と称する。

【００２９】図２は、パーソナルコンピュータ１の構成を説明する図である。CPU（CentralProcessing Unit）１１は、後述する機能を実現するための各種アプリケーションプログラムや、OS（Operating System)を実際に実行する。ROM（Read-only Memory）１２は、一般的には、CPU１１が使用するプログラムや演算用のパラメータのうちの基本的に固定のデータを格納する。RAM（Random-Access Memory）１３は、CPU１１の実行において使用するプログラムや、その実行において適宜変化するパラメータを格納する。これらはCPUバスなどから構成されるホストバス１４により相互に接続されている。

【００３０】ホストバス１４は、ブリッジ１５を介して、PCI(Peripheral Component Interconnect/Interface)バスなどの外部バス１６に接続されている。

【００３１】キーボード１８は、CPU１１に各種の指令

を入力するとき、使用者により操作される。マウス１９は、ディスプレイ２０の画面上のポイントの指示や選択を行うとき、使用者により操作される。ディスプレイ２０は、液晶表示装置またはCRT（Cathode Ray Tube）などから成り、各種情報をテキストやイメージで表示する。HDD（Hard Disk Drive）２１は、ハードディスクを駆動し、それらにCPU１１によって実行するプログラムや情報を記録または再生させる。

【００３２】ドライブ２２は、装着されている磁気ディスク４１、光ディスク４２（CDを含む）、光磁気ディスク４３、または半導体メモリ４４に記録されているデータまたはプログラムを読み出して、そのデータまたはプログラムを、インターフェース１７、外部バス１６、ブリッジ１５、およびホストバス１４を介して接続されているRAM１３に供給する。

【００３３】USBポート２３－１には、USBケーブルを介して、ポータブルデバイス５－１が接続される。USBポート２３－１は、インターフェース１７、外部バス１６、ブリッジ１５、またはホストバス１４を介して、HDD２１、CPU１１、またはRAM１３から供給されたデータ（例えば、コンテンツまたはポータブルデバイス５－１のコマンドなどを含む）をポータブルデバイス５－１に出力する。

【００３４】USBポート２３－２には、USBケーブルを介して、ポータブルデバイス５－２が接続される。USBポート２３－２は、インターフェース１７、外部バス１６、ブリッジ１５、またはホストバス１４を介して、HDD２１、CPU１１、またはRAM１３から供給されたデータ（例えば、コンテンツまたはポータブルデバイス５－２のコマンドなどを含む）をポータブルデバイス５－２に出力する。

【００３５】USBポート２３－３には、USBケーブルを介して、ポータブルデバイス５－３が接続される。USBポート２３－３は、インターフェース１７、外部バス１６、ブリッジ１５、またはホストバス１４を介して、HDD２１、CPU１１、またはRAM１３から供給されたデータ（例えば、コンテンツまたはポータブルデバイス５－３のコマンドなどを含む）をポータブルデバイス５－３に出力する。

【００３６】スピーカ２４は、インターフェース１７から供給された音声信号を基に、コンテンツに対応する所定の音声を出力する。

【００３７】これらのキーボード１８乃至スピーカ２４は、インターフェース１７に接続されており、インターフェース１７は、外部バス１６、ブリッジ１５、およびホストバス１４を介してCPU１１に接続されている。

【００３８】通信部２５は、ネットワーク２が接続され、CPU１１、またはHDD２１から供給されたデータ（例えば、コンテンツの送信要求など）を、所定の方式のパケットに格納して、ネットワーク２を介して、送信するとともに、ネットワーク２を介して、受信したパケットに格納されているデータ（例えば、コンテンツなど）をCPU１１、RAM１３、またはHDD２１に出力する。

【００３９】通信部２５は、外部バス１６、ブリッジ１５、およびホストバス１４を介してCPU１１に接続されている。

【００４０】以下、USBポート２３－１乃至２３－３を個々に区別する必要がないとき、単に、USBポート２３と称する。

【００４１】図3は、CPU１１がコンテンツ管理プログラム（アプリケーションプログラム）を実行することにより実現されるパーソナルコンピュータ１の機能を説明するブロック図である。

【００４２】GUI（Graphical User Interface）部１００は、使用者によるキーボード１８またはマウス１９の操作に対応して、曲管理部１０４に、使用者が所望とするコンテンツに対応する曲名またはコンテンツが格納されているファイルのファイル名などを供給するとともに、データベース１０７へのコンテンツに対応するデータの登録を要求する。

【００４３】GUI部１００は、曲管理部１０４からコンテンツに対応するデータ、例えば、曲ID、曲名、または、アーティスト名などのデータを取得して、曲ID、曲名、または、アーティスト名などをディスプレイ２０に表示させる。

【００４４】GUI部１００は、使用者の操作によりコンテンツの再生が要求されたとき、再生が要求されたコンテンツに対応する曲IDをコンテンツ管理処理部１０２に供給すると共に、コンテンツの再生をコンテンツ管理処理部１０２に要求する。

【００４５】GUI部１００は、使用者の操作によりコンテンツの転送（チェックアウト、コピー、または移動など）が要求されたとき、転送が要求されたコンテンツに対応する曲IDを転送処理部１０３に供給すると共に、コンテンツの転送を転送処理部１０３に要求する。

【００４６】GUI部１００は、使用者の操作によりコンテンツの録音（ドライブ２２に装着されたＣＤ（光ディスク４２に対応する）に記録されたコンテンツを曲ファイル格納部１０８－１，１０８－２（HDD２１に対応する）に格納させる処理）が要求されたとき、録音が要求されたコンテンツに対応する曲IDを録音管理部１０１に供給すると共に、コンテンツの録音を録音管理部１０１に要求する。また、GUI部１００は、プレイリストIDに対応するコンテンツの曲IDやファイル名を一覧にしたプレイリストをディスプレイ２０に表示させる。

【００４７】録音管理部１０１は、GUI部１００によりコンテンツの録音が要求されたとき、録音処理を実行する。録音管理部１０１は、録音しようとするＣＤがドライブ２２に装着されたとき、そのＣＤのTOC（Table of Contents）を読出し、そこに含まれるコンテンツの数

や、録音時間などの情報からメディア固有識別情報を生成する。

【００４８】また、録音管理部１０１は、ＣＤなどからコンテンツを曲ファイル格納部１０８に録音させる際に、ＣＤの各トラック毎の録音（記録）された回数を示す録音履歴情報を生成、または、（既に録音履歴情報が生成されていた場合）更新し、内蔵するメモリに記憶する。また、録音管理部１０１は、再び同じＣＤがドライブ２２に装着されると、録音履歴情報を読み出して、各トラックの録音回数の情報をGUI部１００に出力し、ディスプレイ２０に表示させる。また、録音管理部１０１は、そのＣＤを初めて録音処理する際に、通信部２５、および、ネットワーク２を介してWWWサーバ４などにアクセスして、各コンテンツのタイトル情報をダウンロードして、ダウンロードしたコンテンツのタイトル情報とメディア固有識別情報をタイトル保存情報として内蔵するメモリに記憶させる。また、録音管理部１０１は、１回の録音処理で録音される複数のコンテンツをまとめるインデックスとしてプレイリストIDを生成し、コンテンツと共に曲管理部１０４に出力して、曲ファイル格納部１０８に記録させる。尚、タイトル保存情報については、図４を参照して後述する。また、録音管理部１０１は、ネットワーク２および通信部２５を介して、EMDサーバ３より配信されるコンテンツを録音することもできる。

【００４９】コンテンツ管理処理部１０２は、GUI部１００からコンテンツの再生が要求されたとき、曲管理部１０４に、再生が要求されたコンテンツに対応する曲ID、または、再生が要求されたプレイリストに含まれるコンテンツに対応する曲ID（再生が要求されたプレイリストに対応するプレイリストIDと共に記録されたコンテンツの曲ID）を供給すると共に、コンテンツに対応するファイル名を要求する。コンテンツ管理処理部１０２は、曲管理部１０４からファイル名を取得したとき、曲管理部１０４、ファイル検索部１０６、およびデータベース１０７を介して、曲ファイル格納部１０８－１または１０８－２から、コンテンツを取得する。

【００５０】コンテンツ管理処理部１０２は、取得したコンテンツをPC（Protected Content）プラグイン１０９－１または１０９－２に供給する。

【００５１】PCプラグイン１０９－１は、コンテンツ管理処理部１０２からコンテンツが供給されたとき、コンテンツが暗号化されていない場合、符号化されているコンテンツを復号して、音声データを音声出力部１１０－１に供給する。PCプラグイン１０９－１は、コンテンツ管理処理部１０２からコンテンツが供給された場合、コンテンツが暗号化されているとき、暗号化されているコンテンツを復号するとともに、符号化されているコンテンツを復号して、音声データを音声出力部１１０－１に供給する。音声出力部１１０－１は、音声データを基に、音声信号を生成して、スピーカ２４に音声を出力させる。

【００５２】PCプラグイン１０９－２は、コンテンツ管理処理部１０２からコンテンツが供給されたとき、コンテンツが暗号化されていない場合、符号化されているコンテンツを復号して、音声データを音声出力部１１０－２に供給する。PCプラグイン１０９－２は、コンテンツ管理処理部１０２からコンテンツが供給されたとき、コンテンツが暗号化されている場合、暗号化されているコンテンツを復号するとともに、符号化されているコンテンツを復号して、音声データを音声出力部１１０－２に供給する。音声出力部１１０－２は、音声データを基に、音声信号を生成して、スピーカ２４に音声を出力させる。

【００５３】使用者は、PCプラグインを更に追加インストールすることができる。

【００５４】以下、PCプラグイン１０９－１またはPCプラグイン１０９－２を個々に区別する必要が無いとき、単に、PCプラグイン１０９と称する。

【００５５】転送処理部１０３は、GUI部１００からコンテンツの転送が要求されたとき、転送が要求されたコンテンツに対応する曲IDを曲管理部１０４に供給すると共に、コンテンツに対応するファイル名を要求する。転送処理部１０３は、曲管理部１０４からファイル名を取得したとき、曲管理部１０４、ファイル検索部１０６、およびデータベース１０７を介して、曲ファイル格納部１０８－１または１０８－２から、ファイル名に対応するコンテンツを取得する。

【００５６】転送処理部１０３は、取得したコンテンツをPDプラグイン１１１－１または１１１－２に供給する。

【００５７】PDプラグイン１１１－１は、ポータブルデバイス５－１にコンテンツを転送するとき、ポータブルデバイス５－１と相互認証する。相互認証されなかったとき、PDプラグイン１１１－１は、ポータブルデバイス５－１にコンテンツを転送しない。

【００５８】PDプラグイン１１１－１は、転送処理部１０３からコンテンツが供給されたとき、コンテンツが暗号化されている場合、コンテンツに関連するデータと共にコンテンツをポータブルデバイス５－１に供給する。PDプラグイン１１１－１は、転送処理部１０３からコンテンツが供給された場合、コンテンツが暗号化されていないとき、コンテンツを暗号化して、コンテンツに関連するデータと共に暗号化されたコンテンツをポータブルデバイス５－１に供給する。なお、相互認証の処理は、ポータブルデバイス５－１がパーソナルコンピュータ１に接続されたとき、実行されるようにしてもよい。

【００５９】PDプラグイン１１１－２は、ポータブルデバイス５－２にコンテンツを転送するとき、ポータブルデバイス５－２と相互認証する。相互認証されなかった

とき、PDプラグイン１１１－２は、ポータブルデバイス５－２にコンテンツを転送しない。

【００６０】PDプラグイン１１１－２は、転送処理部１０３からコンテンツが供給されたとき、コンテンツが暗号化されている場合、コンテンツに関連するデータと共にコンテンツをポータブルデバイス５－２に供給する。PDプラグイン１１１－２は、転送処理部１０３からコンテンツが供給されたとき、コンテンツが暗号化されていない場合、コンテンツを暗号化して、コンテンツに関連するデータと共に暗号化されたコンテンツをポータブルデバイス５－２に供給する。なお、相互認証の処理は、ポータブルデバイス５－２がパーソナルコンピュータ１に接続されたとき、実行されるようにしてもよい。

【００６１】使用者は、PDプラグインを更に追加インストールすることができる。

【００６２】以下、PDプラグイン１１１－１またはPDプラグイン１１１－２を個々に区別する必要がないとき、単に、PDプラグイン１１１と称する。

【００６３】曲管理部１０４は、データベース１０７に、コンテンツに対応する曲名、または、ファイル名、および、コンテンツに対応するメディア固有識別情報、および、プレイリストIDなどのデータを記録させると共に、データベース１０７から、指定された曲名またはファイル名などを読み出す。曲管理部１０４は、GUI部１００から曲名またはファイル名を受信したとき、データベース１０７にレコードを追加させ、レコードのアイテムとして、曲名またはファイル名を記録させるとともに、メディア固有識別情報、および、プレイリストIDも追加する。

【００６４】曲管理部１０４は、GUI部１００からの要求に対応して、データベース１０７に記録されている全ての曲名および曲IDなどをデータベース１０７から読み出して、GUI部１００に供給する。また、曲管理部１０４は、録音管理部１０１からメディア固有識別情報が供給されたとき、メディア固有識別情報に対応する曲IDやファイル名をデータベース１０７から読み出し、GUI部１００に供給する。さらに、曲管理部１０４は、録音管理部１０１からプレイリストIDが供給されたとき、プレイリストIDに対応する曲IDやファイル名をGUI部１００に供給する。

【００６５】曲管理部１０４は、コンテンツ管理処理部１０２から曲IDが供給されたとき、曲IDに対応するファイル名をデータベース１０７から読み出して、読み出したファイル名をコンテンツ管理処理部１０２に供給する。曲管理部１０４は、転送処理部１０３から曲IDが供給されたとき、曲IDに対応するファイル名をデータベース１０７から読み出して、読み出したファイル名を転送処理部１０３に供給する。

【００６６】ファイル検索部１０６は、曲管理部１０４の要求に対応して、データベース１０７から取得したファイル名を基に、曲ファイル格納部１０８－１または１０８－２からファイル名に対応するファイルを検索する。ファイル検索部１０６は、曲ファイル格納部１０８－１または１０８－２から読み出したファイルを曲管理部１０４に供給するか、またはファイルのファイル名を変更して、ファイル名を変更したファイルを曲管理部１０４に供給する。

【００６７】曲管理部１０４は、ファイル検索部１０６から供給された、コンテンツが格納されているファイルをコンテンツ管理処理部１０２または転送処理部１０３に供給する。

【００６８】データベース１０７は、コンテンツに関するデータ、例えば、曲のID、曲名、ファイル名、メディア固有識別情報、プレイリストID、またはその他の属性などを記録する。データベース１０７は、HDD２１に格納される。

【００６９】次に、図４を参照して、録音管理部１０１が内蔵するメモリに記憶するタイトル保存情報について説明する。タイトル保存情報は、録音管理部１０１の内蔵するメモリに記録される情報であり、録音されたCDのメディア固有識別情報、CDのアルバム名、各コンテンツのタイトル名、アーティスト名、および、各コンテンツの情報を提供するサーバのURL（Universal Resource Locater）といった情報が含まれている。また、タイトル保存情報は、GUI部１００により読み出され、録音処理などを実行する際の表示データとしての情報も保持している。

【００７０】今の場合、図４の第1行目には、「DISCID＝５５４４３３２２」と示されており、メディア固有識別情報が記録されている。メディア固有識別情報は、各CDのTOCに記録されたコンテンツの数（曲数）や全記録時間などから求められる値（今の場合、５５４４３３２２）であり、このメディア固有識別情報によりCDが識別される。

【００７１】第２行目には、「DTITLE＝KING／RIDING」と示されており、このCDのタイトルとして「KING／RIDING」が登録されていることが示されている。第３行目乃至第１０行目には、「TTITLE０＝ライディング」、「TTITLE１＝テン・ロング」、「TTITLE２＝キー」、「TTITLE３＝マリー」、「TTITLE４＝スリー」、「TTITLE５＝ヘルプ」、「TTITLE６＝アイ」、および、「TTITLE７＝ウォリード」が示されており、各トラック単位で、記録されているコンテンツのタイトル名が記録されている。今の場合、トラック番号が０に対応するコンテンツ（１曲目のコンテンツ）のタイトルが、「ライディング」であり、トラック番号が１に対応するコンテンツ（２曲目のコンテンツ）のタイトルが、「テン・ロング」であることが示されており、以下３曲目以降のコンテンツのタイトルが「キー」、「マリー」、「スリー」、「ヘルプ」、「アイ」、および、「ウォリード」と記録されて

いる。尚、今の場合、第１１行目、第１２行目に示されている、トラック番号が８，９番のタイトルは、ブランクになっている。

【００７２】第１３行目には、「EXTD＝ARTIST：KING」と示されており、アーティスト名が「KING」であることが示されている。第１４行目、第１５行目には、「EXTD＝URL１：アーティストディスコグラフィーhttp:www.cdnew.co.jp./artist.asp.artistID=1122」、「EXTD＝URL２：CDNEW JAPANホームhttp:www.cdnew.co.jp./index.asp」と示されており、それぞれ、上記の第1行目乃至第１３行目までの情報を入手したWWWサーバ４の情報が記録されている。「アーティストディスコグラフィー」、「CDNEW JAPANホーム」は、WWWサーバ４の名称であり、それ以下の「http:www.cdnew.co.jp./artist.asp.artistID=1122」、「http:www.cdnew.co.jp./index.asp」は、それぞれのURLを示している。

【００７３】次に、図５を参照して、ＣＤ（図２の光ディスク４２に対応する）がドライブ２２に装着されたときに、コンテンツ管理プログラム（アプリケーションプログラム）の録音管理部１０１からの指令に基づいて、GUI部１００がディスプレイ２０上に表示するウィンドウの表示例について説明する。ウィンドウ上には、ＣＤタブ２０１、インポートタブ２０２、プレイリストタブ２０３、チェックイン／チェックアウトタブ２０４、機器メディアタブ２０５、および、インターネットタブ２０６が設けられており、それぞれのタブをクリックすることにより、アクティブにされると、それぞれの表示画面がフィールド２３１上に表示される。今の場合、ＣＤタブ２０１がアクティブの状態となっており、ＣＤに関する情報が、フィールド２３１に表示されている。

【００７４】ＣＤタブ２０１の下には、取出しボタン２１１が表示されており、クリックされるとドライブ２２に装着されたＣＤが取り出される。取出しボタン２１１の右側には、録音停止ボタン２１２および、録音開始ボタン２１３が表示されており、録音開始ボタン２１３がクリックされるとフィールド２３１上で、指定されたＣＤのコンテンツのHDD２１への録音が開始され、録音中に録音停止ボタン２１２がクリックされると録音処理が停止される。

【００７５】録音開始ボタン２１３の右側には、ビットレート表示欄２１４が表示されており、クリックすると様々なビットレートがドロップダウンリストとして表示され、ポインタにより録音のビットレートを選択することができる。ビットレート表示欄２１４の右側には、ドライブ表示欄２１５が表示されており、録音されるCDが装着されているドライブが表示されており、クリックすることでドロップダウンリストとして選択可能なドライブ名が表示され、ポインタにより選択することができる。さらに、ドライブ表示欄２１５の右側には、録音先表示欄２１６が表示されており、クリックするとドロップダウンリストが表示され、録音先として、HDD２１やポータブルデバイス５－１乃至５－３などが表示され、ポインタにより選択することができる。

【００７６】各タブの上には、タスクバー２１７が表示されている。タスクバー２１７には、停止ボタン２１７ａ、再生ボタン２１７ｂ、および、その他の操作ボタンが表示されており、フィールド２３１上で指定されたコンテンツの再生、および、停止といった各種の操作をさせることができる。また、停止ボタン２１７ａの上には、アルバム名表示欄２１７ｃが表示されており、今の場合、アルバム名として「ライディング」が表示されている。

【００７７】取出しボタン２１１の下には、アルバム名表示欄２１１が表示されており、挿入されたＣＤのアルバム名が表示される。今の場合、アルバム名として、「ライディング」が表示されている。アルバム名表示欄２２１の右側には、アーティスト名表示欄２２２が表示されており、今の場合、アーティスト名として、「キング」が表示されている。アーティスト名表示欄２２２の右側には、ジャンル名表示欄２２３が表示されており、今の場合、「ロック」と表示されている。

【００７８】フィールド２３１には、挿入されたＣＤのコンテンツが示されており、上からＣＤトラック番号順に表示されている。各コンテンツ毎に、右側から、ＣＤトラック番号、タイトル名、アーティスト名、ジャンル、演奏時間、容量、および録音状態が表示されている。ＣＤトラック番号が表示されている欄には、ＣＤトラック番号の他に、左からチェックボックス２２４ａ乃至２２４ｈ、および、再生可能符号（今の場合、ト音記号）が表示されている。チェックボックス２２４ａ乃至２２４ｈは、クリックされるとチェックマークが表示され、さらにもう一度クリックするとチェックマークが非表示となる。チェックボックス２２４ａ乃至２２４ｈのうちチェックされた（チェックマークの入った）コンテンツがＣＤから録音される。今の場合、全てのコンテンツのチェックボックス２２４ａ乃至２２４ｈがチェックされているので、この状態で録音開始ボタン２１３がクリックされると、全てのコンテンツがＣＤからHDD２１に録音される。また、ト音記号で示される符号は、現在再生可能な状態であることを示す表示であり、再生不能であるときは、例えば、休符（図９）に表示が変わる。

【００７９】次に、図６のフローチャートを参照して、パーソナルコンピュータ１のCDのコンテンツを録音するときのＣＤ装着時の処理について説明する。ＣＤが、ドライブ２２に装着されると、ステップＳ１において、録音管理部１０１は、装着されたＣＤがオーディオＣＤ（音楽コンテンツが記録されたＣＤ）であるか否かを判定し、オーディオＣＤであると判定した場合、その処理は、ステップＳ２に進む。

【００８０】ステップＳ２において、録音管理部１０１

は、ＣＤ内に記録されているＴＯＣ（Table of Contents）の情報を読み込んで、コンテンツの数や、ＣＤの総録音時間などからメディア固有識別情報を生成する。

【００８１】ステップＳ３において、録音管理部１０１は、曲管理部１０４に対して、メディア固有識別情報を送出し、過去に登録された同じメディア固有識別情報に対応するプレイリストIDが存在するか否かを問い合わせる。同じメディア固有識別情報が存在せず、対応するプレイリストIDが存在しないと判定された場合、その処理は、ステップＳ４に進む。

【００８２】ステップＳ４において、録音管理部１０１は、自分自身に内蔵されたメモリに存在する録音履歴情報を検索し、装着されたＣＤの各トラックの録音履歴が存在するか否かを判定する。ＣＤの各トラックの録音履歴情報が存在すると判定された場合、ステップＳ５において、録音管理部１０１は、検索された録音履歴情報から、そのコンテンツの録音回数を集計してディスプレイ２０に表示する。このとき、例えば、フィールド２３１上の録音状態の欄に「録音済み」が表示される（図９）。さらに、例えば、履歴回数が２回である場合、録音状態表示欄には、「録音済み」の表示の右側に、［２］が履歴回数として表示される（図１１）。

【００８３】ステップＳ６において、録音管理部１０１は、GUI部１００に対して、未録音トラックのチェックボックスをチェックしてディスプレイに表示させる。例えば、全てのコンテンツが録音済みではない場合、図５に示すように、全てのトラックのチェックボックス２２４ａ乃至２２４ｈがチェックされることになる。

【００８４】ステップＳ７において、記録管理部１０１は、生成されたメディア固有識別情報に基づいて、内蔵するメモリに記憶されたタイトル保存情報を検索する。ステップＳ８において、録音管理部１０１は、内蔵するメモリに生成されたメディア固有識別情報を含むタイトル保存情報が存在するか否かを判定し、存在すると判定した場合その処理は、ステップＳ９に進む。

【００８５】ステップＳ９において、録音管理部１０１は、検索されたタイトル保存情報に保存されている各コンテンツのタイトルの情報を取得し、GUI部１００に出力して、ディスプレイ２０に表示させる。例えば、図４に示したタイトル保存情報が取得されると、図５に示すように、フィールド２３１上に、各コンテンツのタイトル名、アーティスト名、が表示されることになる。

【００８６】ステップＳ１０において、録音管理部１０１は、アルバム名を新規プレイリストとして登録し、対応するプレイリストIDと共に曲管理部１０４に転送し、格納させる。例えば、図５に示すような場合、「ライディング」がプレイリストとして登録されることになる。

【００８７】ステップＳ１１において、録音管理部１０１は、録音開始ボタン２１３がクリックされたか否かを判定し、クリックされたと判定された場合、ステップＳ１２において、録音管理部１０１は、録音処理を実行する。

【００８８】ここで、図７を参照して、録音処理について説明する。ステップＳ３１において、録音管理部１０１は、GUIに問い合わせて、選択されているコンテンツをＣＤから読み出す。例えば、図８に示すように、チェックボックス２２４ａ，２２４ｂ，２２４ｅ，２２４ｇがチェックされて、録音開始ボタン２１３がクリックされた場合、トラック番号１，２，５，７のコンテンツがＣＤから読み出されることになる。

【００８９】ステップＳ３２において、録音管理部１０１が、ＣＤから読み出したコンテンツを所定の方式で圧縮し、暗号化して、曲管理部１０４に出力する。ステップＳ３３において、曲管理部１０４は、権利化情報を権利格納部１０５に格納させて、暗号化したコンテンツをデータベース１０７に登録する。

【００９０】ステップＳ３４において、曲管理部１０４は、暗号化したコンテンツを曲ファイル格納部１０８に格納する。

【００９１】このステップＳ３１乃至Ｓ３４の処理がなされている間に、GUI部１００は、図９に示すように、ウィンドウ上に録音状態表示欄２４１を表示し、その中に録音状態表示バー２４１ａと、残り時間表示欄２４１ｂを表示する。録音時間表示バー２４１ａは、選択された全てのコンテンツが録音されるのに必要とされる時間の全体を示しており、処理が進むにつれて、処理終了の割合を示す所定の色のバーが図中左側から表示されていく。最終的に処理が全て終了するとき、録音状態表示バー２４１ａ全体に、所定の色のバーが表示される。また、録音が完了したコンテンツ、例えば、図９に示すトラック番号１，２のコンテンツは、録音状態の表示欄に「録音済み」が表示され、さらに、現在録音中のコンテンツには、そのコンテンツの録音処理の進捗状況を全体を１００％として表示する。今の場合、トラック番号５のコンテンツの録音状態の表示欄には「４％」が表示されており、トラック番号５のコンテンツの全体の４％の録音が完了していることが示されている。

【００９２】ステップＳ３５において、録音管理部１０１は、各トラックの録音回数を記録した録音履歴情報を更新する。また、GUI部１００は、図１０に示すように、ディスプレイ２０に、プレイリストタブ２０３がアクティブにされているプレイリストを表示する。図１０に示す、プレイリストのウィンドウでは、フィールド２３１には、録音されたコンテンツが一覧となって表示される。また、フィールド２３１の左側には、フィールド２５２が表示され、その上に、プレイリスト表示欄２５１が表示される。今の場合、プレイリスト表示欄２５１には、「ライディング」が表示されている。

【００９３】また、フィールド２５２は、複数に存在するプレイリストを樹形図状に表示している。すなわち、

フィールド２５２の最上段には、「すべてのプレイリスト」と表示された欄のブランチとして、「ペイント」と「ライディング」の２つのプレイリストが表示されている。今の場合、フィールド２５２では、「ライディング」がアクティブにされているので、フィールド２３１に表示されているコンテンツが「ライディング」のプレイリストに含まれるものであることが示されている。

【００９４】また、「すべてのプレイリスト」の下には、各コンテンツを「アルバム名」、「アーティスト名」、および、「ジャンル名」により分類して表示させるためのブランチが設けられている。

【００９５】ここで、図6のフローチャートの説明に戻る。

【００９６】ステップＳ１において、オーディオＣＤではないと判定された場合、ステップＳ１３において、録音管理部１０１は、GUI部１００にディスプレイ２０上にオーディオＣＤ以外のＣＤが装着されていることを表示させる。

【００９７】ステップＳ３において、メディア固有識別情報に対応するプレイリストIDが検索されたと判定された場合、ステップＳ１４において、GUI部１０１は、図１１に示すように検索されたプレイリストIDに対応するプレイリストに含まれるコンテンツをＣＤタブ２０１がアクティブにされたウィンドウに表示させ、さらに、プレイリスト選択を示すダイアログボックス２６１を表示させ、既存のプレイリストにＣＤの録音を追加するか、あるいは、新規のプレイリストを生成するかを問い合わせるウィンドウを表示する。

【００９８】このとき、図１１に示すように、ダイアログボックス２６１には、新規プレイリストを選択するときにクリックされる、ボタン２６２ａと、既存のプレイリストに追加するとき選択されるボタン２６２ｂが表示される。ボタン２６２ａがクリックされると、ボタン２６２ａがチェックされ（黒丸が表示され）、フィールド２６４に新たなプレイリスト（の名称）を入力することができる。２６２ｂがクリックされると、ボタン２６２ｂがチェックされ（今の場合）、フィールド２６５に登録されていたプレイリストが表示される。尚、フィールド２６５のプレイリストは、新たに上書きして登録することもできる。

【００９９】フィールド２６５の下には、録音開始ボタン２６３ａが表示されており、クリックされると録音が開始される。録音開始ボタン２６３ａの右側には、キャンセルボタン２６３ｂが表示されており、クリックされると処理がキャンセルされ、キャンセルボタン２６３ｂの右側には、ヘルプボタン２６３ｃが表示され、クリックされると、ヘルプ画面が表示される。

【０１００】ここで、図6のフローチャートの説明に戻る。

【０１０１】ステップＳ１５において、録音管理部１０１は、新規プレイリストが選択されて、録音開始ボタン２６３ａがクリックされたか否かを判定し、ボタン２６２ａがクリックされて、新規プレイリストが選択されて、録音開始ボタン２６３ａがクリックされた場合、その処理は、ステップＳ４に進み、それ以降の処理が繰り返される。

【０１０２】ステップＳ１５において、新規プレイリストが選択されず、録音開始ボタン２６３ａがクリックされたと判定された場合、すなわち、図１１に示すように、ボタン２６２ｂがクリックされ、既存のプレイリストが選択された状態で、録音開始ボタン２６３ａがクリックされた場合、その処理は、ステップＳ１２に進み、上記の録音処理が実行される。

【０１０３】ステップＳ４において、各トラックの録音履歴情報が存在しないと判定された場合、ステップＳ５における、録音履歴情報の集計処理がスキップされて、その処理は、ステップＳ６に進む。

【０１０４】ステップＳ８において、タイトル保存情報が存在しないと判定された場合、ステップＳ１６において、録音管理部１０１は、通信部２５、および、ネットワーク２を介して、WWWサーバ４にアクセスし、ドライブ２２に挿入されたＣＤに含まれるコンテンツのタイトル情報を検索する。

【０１０５】ステップＳ１７において、録音管理部１０１は、タイトル情報が検索されたか否かを判定し、タイトル情報が検索されたと判定された場合、その処理は、ステップＳ９に進み、それ以降の処理が繰り返される。ステップＳ１７において、タイトル情報が検索されなかったと判定された場合、ステップＳ１８において、GUI部１００は、図１２に示すように、フィールド２３１に表示される各コンテンツのタイトル名の欄には、「未タイトル」と表示し、アーティスト名、ジャンル名の欄には、「Unknown」を表示する。このとき、使用者は、必要に応じて、タイトル名、アーティスト名、および、ジャンル名を入力することができる。

【０１０６】以上の処理により、録音しようとするＣＤのコンテンツがドライブ２２に装着されると、使用者は、そのＣＤが過去に録音されたものであるか否かを意識しなくても、過去に録音されている場合には、そのコンテンツの録音回数やビットレートなどの情報が表示されることになるので、間違って同じコンテンツを複数回録音することが回避され、HDD２１の記憶領域を無駄に使用しないようにすることができる。また、例えば、同じコンテンツを異なるビットレートで録音しようとする場合、録音しようとするＣＤがドライブ２２に装着されると、過去に録音されたコンテンツの情報が検索されて、表示されるので、使用者は、検索処理を実行することなく、新たに録音しようとするコンテンツのビットレートのみを指定することができるようになる。

【０１０７】さらに、上記の処理により、過去に録音さ

れたプレイリスト単位でコンテンツの情報が検索されて、表示されるので、過去の録音処理で、例えば、プレイリストに登録された複数のコンテンツのうち、全部が録音できずに処理を途中で終了していた場合、同じＣＤをドライブ２２に装着するだけで、未録音のコンテンツだけを継続して、録音させることができ、その際、新たなタイトル名の検索や、編集といった処理を省くことができる。

【０１０８】次に、図１３のフローチャートを参照して、タイトル保存情報の保存処理について説明する。ステップＳ４１において、録音管理部１０１は、例えば、取出しボタン２１１がクリックされるなどして、ドライブ２２に装着されていたオーディオＣＤがイージェクトされたか（取出し処理がなされたか）否かを判定し、オーディオＣＤがイージェクトされていないと判定した場合、その処理は、ステップＳ４２に進む。

【０１０９】ステップＳ４２において、録音管理部１０１は、例えば、ＣＤドライブ標示欄２１５がクリックされるなどして、ドロップダウンリストが表示され、別のドライブに切り替えられたか否かを判定し、ＣＤドライブが切り替えられていないと判定した場合、その処理は、ステップＳ４３に進む。

【０１１０】ステップＳ４３において、録音管理部１０１は、録音処理が終了されたか、すなわち、例えば、プレイリストとして設定された複数のコンテンツの録音処理が終了したか否かを判定し、コンテンツの録音処理が終了していないと判定した場合、その処理は、ステップＳ４１の処理に戻り、それ以降の処理が繰り返される。

【０１１１】ステップＳ４１において、オーディオＣＤがイージェクトされたと判定された場合、ステップＳ４２において、ＣＤドライブが切り替えられたと判定された場合、および、ステップＳ４３において、録音処理が終了したと判定された場合、録音管理部１０１は、ステップＳ４４において、現状のＣＤのアルバム名、および、タイトル情報をタイトル保存情報として、内蔵するメモリに保存する（上書きする）。

【０１１２】すなわち、録音管理部１０１は、アプリケーションソフトウェアが起動している間に、ＣＤの取出し、ドライブの変更、および、録音処理の終了を常に監視し、いずれかの処理がなされた場合、タイトル保存情報を書き換える。

【０１１３】以上の処理により、例えば、図１０に示すウィンドウ上で、所望のコンテンツを選択して、再生ボタン２１７ｂをクリックすることで再生させることもできるが、アプリケーションソフトウェアが起動していない状態から、所定のアイコンをクリックするだけで、所望のプレイリストを一機に再生させることもできる。

【０１１４】次に、録音されたプレイリストに対応したショートカットアイコンを生成し、上記のウィンドウが立上っていない状態（アプリケーションソフトウェアが起動していない状態）から、そのショートカットアイコンがクリックされることにより、プレイリストに登録された複数のコンテンツが一機に再生される処理について説明する。

【０１１５】例えば、図１０の「ライディング」と表示されたプレイリスト名表示部２５２ａをドラッグして、アプリケーションソフトウェアのウィンドウ以外の画面（例えば、Windows98（商標）上のデスクトップ画面）上にドロップすることにより、「ライディング」に対応するプレイリストIDが登録されている、図１４に示すようなショートカットアイコン２８１が生成され、ディスプレイ２０上に表示される。

【０１１６】ここで、図１５のフローチャートを参照して、このショートカットアイコン２８１を使用した再生処理を説明する。

【０１１７】ステップＳ５１において、パーソナルコンピュータ１のCPU１１により実行されているOSは、ショートカットアイコンがクリックされたか否かを判定し、クリックされるまで、この処理を繰り返し、クリックされると、その処理は、ステップＳ５２に進む。

【０１１８】ステップＳ５２において、OSは、コンテンツ管理プログラムのアプリケーションソフトウェアを起動させる。ステップＳ５３において、起動したコンテンツ管理プログラムのGUI部１００は、所定のウィンドウを表示する。今の場合、ショートカットアイコン２８１には、「ライディング」と表示されているので、例えば、図１０に示すようにプレイリストタブ２０３がアクティブの状態のウィンドウが表示されるものとする。もちろん、それ以外のウィンドウが表示されるように設定しても良い。

【０１１９】ステップＳ５４において、コンテンツ管理部１０２は、ショートカットアイコン２８１に登録されていたプレイリストIDを持つコンテンツを曲管理部１０４に要求する。今の場合、ショートカットアイコン２８１は、「ライディング」と表示されており、プレイリストの「ライディング」に対応するプレイリストIDのコンテンツである「ライディング」、「テン・ロング」、「スリー」、および、「アイ」のコンテンツが、曲管理部１０４に要求されることになる。

【０１２０】ステップＳ５５において、曲管理部１０４は、要求されたプレイリストIDに対応するコンテンツを、ファイル検索部１０６にデータベース１０７から検索させ、曲ファイル格納部１０８より読み出させて、コンテンツ管理部１０２に送出する。すなわち、今の場合、曲管理部１０４は、「ライディング」、「テン・ロング」、「スリー」、および、「アイ」のコンテンツを順次、コンテンツ管理部１０２に送出する。

【０１２１】ステップ５６において、コンテンツ管理部１０２は、PCプラグイン１０９、および、音声出力部１１０を介してスピーカ２４より所定のコンテンツを再生

させる。今の場合、音声出力部１１０は、「ライディング」、「テン・ロング」、「スリー」、および、「アイ」のコンテンツを順次、スピーカ２４から出力させる。

【０１２２】このようにショートカットアイコン２８１を生成して、ディスプレイ上に表示させるようにすることにより、使用者は、このショートカットアイコン２８１をクリックするだけで、所望のプレイリストに登録された複数のコンテンツを再生させることができる。

【０１２３】また、以上のステップＳ５３における処理において、GUI部１００がディスプレイ２０に表示するウィンドウは、例えば、上述のように図１０に示すようなプレイリストタブ２０３がアクティブなったウィンドウでもよいし、それ以外のタブがアクティブとなっているウィンドウでもよく、例えば、図１６に示すように、GUI部１００が、シンプルモードウィンドウと呼ばれるタスクバー２１７だけを表示するように、設定できるようにしてもよい。さらに、GUI部１００がディスプレイ２０に表示するウィンドウは、前回のアプリケーションソフトウェアの起動において、最後に（アプリケーションソフトウェアが終了されたときに）表示されていたウィンドウを表示するように設定できるようにしてもよい。また、GUI部１００は、ステップＳ５３における処理において、ディスプレイ２０に表示するウィンドウを最小化した状態、すなわち、ディスプレイ上には表示させないようにして、コンテンツだけがスピーカ２４から再生されるように設定できるようにしてもよい。

【０１２４】さらに、ショートカットアイコン２８１は、例えば、プレイリストが、所定のＣＤのアルバムのコンテンツから構成されるようなときは、そのＣＤのジャケットとなる画像を表示させるようにしてもよい。

【０１２５】上述した一連の処理は、ハードウェアにより実行させることもできるが、ソフトウェアにより実行させることもできる。一連の処理をソフトウェアにより実行させる場合には、そのソフトウェアを構成するプログラムが、専用のハードウェアに組み込まれているコンピュータ、または、各種のプログラムをインストールすることで、各種の機能を実行することが可能な、例えば汎用のパーソナルコンピュータなどに、プログラム格納媒体からインストールされる。

【０１２６】コンピュータにインストールされ、コンピュータによって実行可能な状態とされるプログラムを格納するプログラム格納媒体は、図２に示すように、磁気ディスク４１（フロッピディスクを含む）、光ディスク４２（CD-ROM(Compact Disc-Read Only Memory)、ＤＶＤ(Digital Versatile Disc)を含む）、光磁気ディスク４３（ＭＤ(MiniDisc)を含む）、または半導体メモリ４４などよりなるパッケージメディア、または、プログラムが一時的若しくは永続的に格納されるROM１２や、ＨＤＤ２１などにより構成される。プログラム格納媒体へのプログラムの格納は、必要に応じて通信部２５などのインタフェースを介して、ローカルエリアネットワークまたはインターネットなどのネットワーク２、デジタル衛星放送といった、有線または無線の通信媒体を利用して行われる。

【０１２７】なお、本明細書において、プログラム格納媒体に格納されるプログラムを記述するステップは、記載された順序に沿って時系列的に行われる処理はもちろん、必ずしも時系列的に処理されなくとも、並列的あるいは個別に実行される処理をも含むものである。

【０１２８】また、本明細書において、システムとは、複数の装置により構成される装置全体を表すものである。

【０１２９】

【発明の効果】本発明の情報処理装置および方法、並びに、プログラム格納媒体によれば、第１の記録媒体に記録されたコンテンツを、第２の記録媒体に記録するとき、コンテンツの情報を記録履歴情報として記憶し、第１の記録媒体に記録されたコンテンツを、第２の記録媒体に再び記録するとき、記録履歴情報として記憶したコンテンツの情報を検索し、表示するようにしたので、過去に記録されたコンテンツを間違って複数回記録することが回避され、第２の記録媒体の記憶領域を無駄に使用しないようにすることが可能となり、さらに、複数回同じコンテンツを記録する際にも、コンテンツの情報を再入力する手間を省くことが可能となる。

【図面の簡単な説明】

【図１】本発明に係る音楽データ管理システムの一実施の形態を示す図である。

【図２】パーソナルコンピュータ１の構成を説明する図である。

【図３】図２のパーソナルコンピュータ１の機能の構成を説明するブロック図である。

【図４】タイトル保存情報を説明する図である。

【図５】ＣＤタブがアクティブのときのウィンドウの表示例を示す図である。

【図６】ＣＤ装着時の処理を説明するフローチャートである。

【図７】録音処理を説明するフローチャートである。

【図８】ＣＤタブがアクティブのときのウィンドウの表示例を示す図である。

【図９】ＣＤタブがアクティブのときのウィンドウの表示例を示す図である。

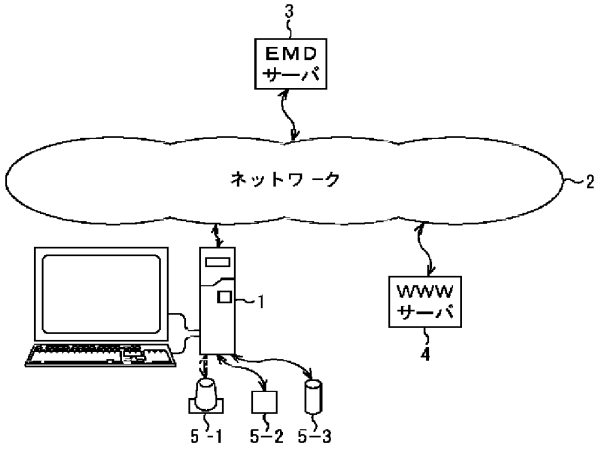
【図１０】プレイリストタブがアクティブのときのウィンドウの表示例を示す図である。

【図１１】ＣＤタブがアクティブのときのウィンドウ上に表示されるプレイリスト選択のダイアログボックスの表示例を示す図である。

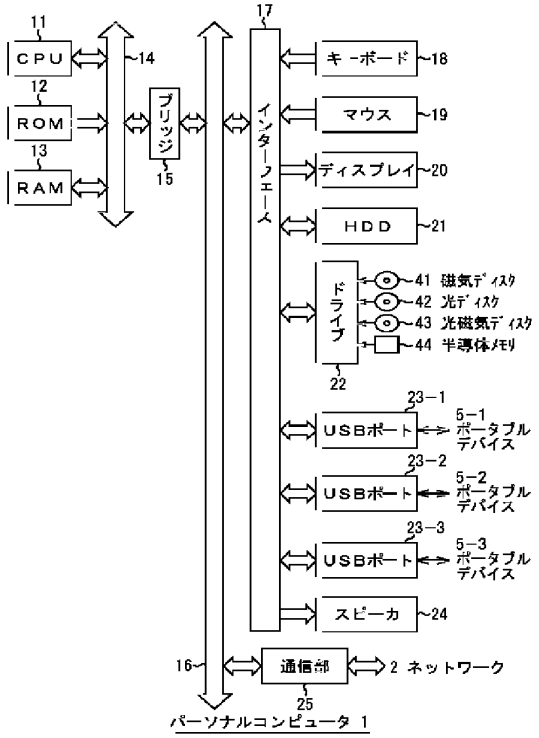
【図１２】ＣＤタブがアクティブのときのウィンドウの表示例を示す図である。

【図１３】タイトル保存情報の保存処理を説明するフローチャートである。
【図１４】ショートカットアイコンの表示例を示す図である。
【図１５】ショートカットアイコン再生処理を説明するフローチャートである。
【図１６】ショートカットアイコン再生処理時にディスプレイに表示されるウィンドウの表示例を示す図である。
【符号の説明】
１　パーソナルコンピュータ，　２　ネットワーク，　３　ＥＭＤサーバ，４　ＷＷＷサーバ，　５－１乃至５－３　ポータブルデバイス，　２１　ＨＤＤ，　２４　スピーカ，　２５　通信部，　１００　ＧＵＩ部，　１０１　録音管理部，　１０２　コンテンツ管理部，　１０３　転送処理部，　１０４　曲管理部，　１０５　権利格納部，　１０６　ファイル検索部，　１０７　データベース，　１０８－１，１０８－２　曲ファイル格納部，　２０１　ＣＤタブ，　２０３　プレイリストタブ，　２１１　取出しボタン，　２１２　録音停止ボタン，２１３　録音開始ボタン，　２２１　アルバム名表示欄，　２２２　アーティスト名表示欄，　２２３　ジャンル名表示欄，　２２４ａ乃至２２４ｈ　チェックボックス，　２３１　フィールド，　２４１　録音状態表示欄，　２４１ａ録音状態表示バー，　２４１ｂ　残り時間表示欄，　２５１　プレイリスト表示欄，　２５２　フィールド，　２５２ａ　プレイリスト表示部，　２６１　ダイアログボックス，　２８１　ショートカットアイコン

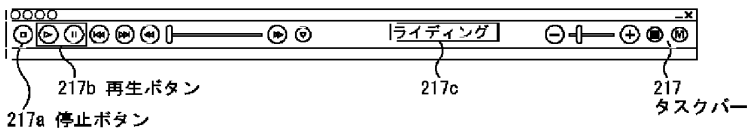
【図１】



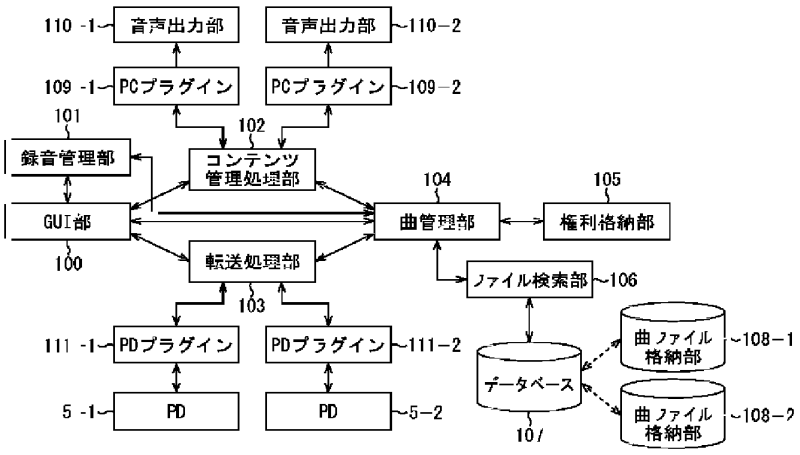

【図２】




【図１６】



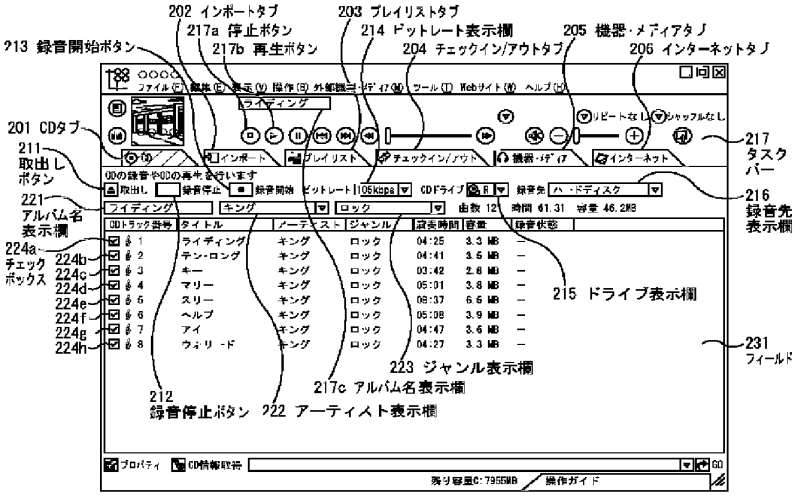
【図３】



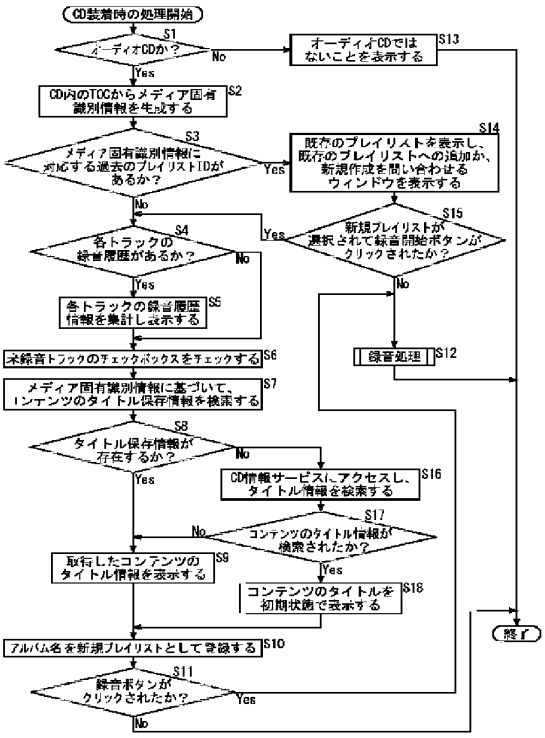

【図４】

```
DISCID=55443322
DTITLE=KING/RIDING
TTILE0=ライディング
TTILE1=テン・ロング
TTILE2=キー
TTILE3=マリー
TTILE4=スリー
TTILE5=ヘルプ
TTILE6=アイ
TTILE7=ウォリード
TTILE8=
TTILE9=
EXTD=ARTIST:KING
EXTD=URL1:ア -ティストディスコグラフィーhttp:www.cdnew.co.jp./artist.asp.artistid=1122
EXTD=URL2:CDNEW JAPANホームhttp:www.cdnew.co.jp./index.asp
```

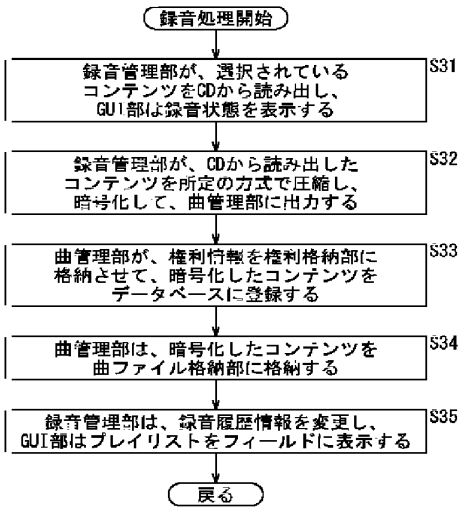
【図５】



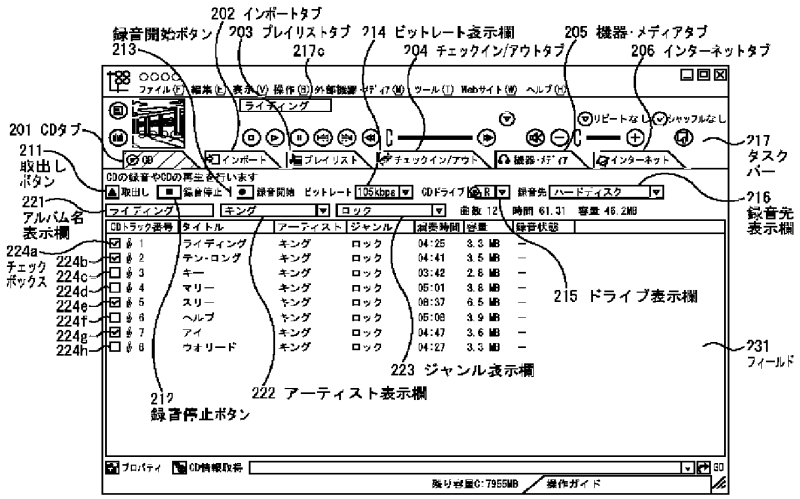
【図6】


CD装着時の処理開始
S1
オーディオCDか？
No
Yes
S13
オーディオCDではないことを表示する
S2
CD内のTOCからメディア固有識別情報を生成する
S3
メディア固有識別情報に対応する過去のプレイリストIDがあるか？
Yes
S14
既存のプレイリストを表示し、既存のプレイリストへの追加か、新規作成を問い合わせるウィンドウを表示する
No
S4
各トラックの録音履歴があるか？
No
Yes
S15
新規プレイリストが選択されて録音開始ボタンがクリックされたか？
Yes
No
S5
各トラックの録音履歴情報を集計し表示する
S6
未録音トラックのチェックボックスをチェックする
S7
メディア固有識別情報に基づいて、コンテンツのタイトル保存情報を検索する
S8
タイトル保存情報が存在するか？
No
Yes
S16
CD情報サービスにアクセスし、タイトル情報を検索する
S17
コンテンツのタイトル情報が検索されたか？
No
Yes
S9
取得したコンテンツのタイトル情報を表示する
S18
コンテンツのタイトルを初期状態で表示する
S10
アルバム名を新規プレイリストとして登録する
S11
録音ボタンがクリックされたか？
Yes
No
S12
録音処理
終了

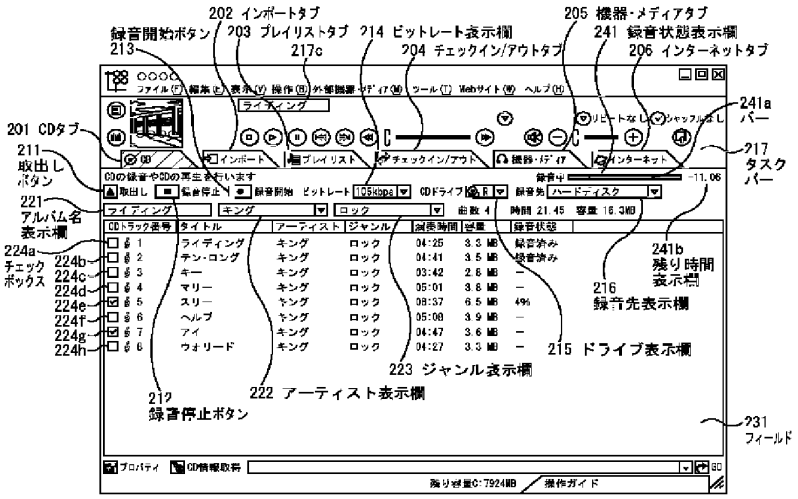
【図7】


録音処理開始
S31
録音管理部が、選択されているコンテンツをCDから読み出し、GUI部は録音状態を表示する
S32
録音管理部が、CDから読み出したコンテンツを所定の方式で圧縮し、暗号化して、曲管理部に出力する
S33
曲管理部が、権利情報を権利格納部に格納させて、暗号化したコンテンツをデータベースに登録する
S34
曲管理部は、暗号化したコンテンツを曲ファイル格納部に格納する
S35
録音管理部は、録音履歴情報を変更し、GUI部はプレイリストをフィールドに表示する
戻る

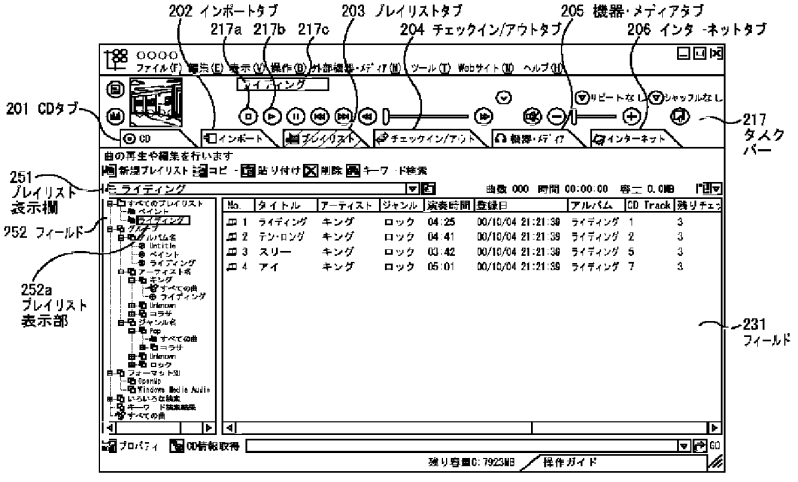
【図8】


202 インポートタブ
203 プレイリストタブ
214 ビットレート表示欄
205 機器・メディアタブ
206 インターネットタブ
録音開始ボタン
213
217c
204 チェックイン/アウトタブ
201 CDタブ
211 取出しボタン
221 アルバム名表示欄
224a チェックボックス
224b
224c
224d
224e
224f
224g
224h
217 タスクバー
216 録音先表示欄
215 ドライブ表示欄
231 フィールド
223 ジャンル表示欄
222 アーティスト表示欄
217g 録音停止ボタン

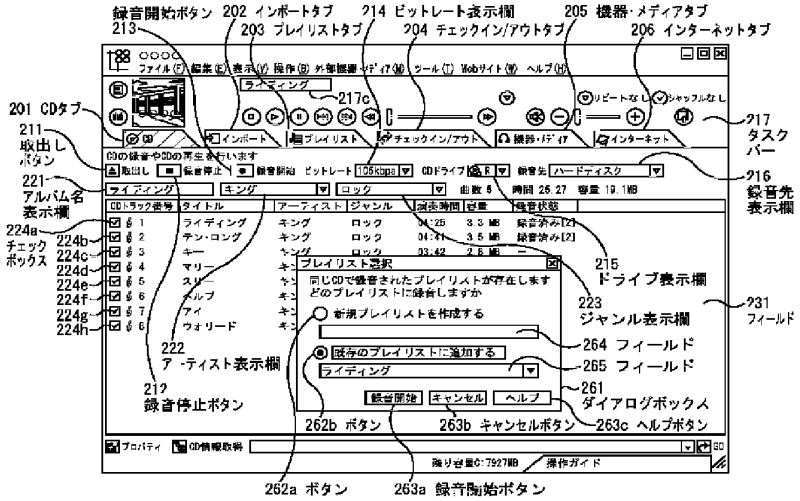
【図９】


202 インポートタブ
203 プレイリストタブ
214 ビットレート表示欄
205 機器・メディアタブ
241 録音状態表示欄
206 インターネットタブ
録音開始ボタン
213
217c
204 チェックイン/アウトタブ
241a バー
201 CDタブ
211 取出しボタン
217 タスクバー
221 アルバム名表示欄
224a チェックボックス
224b
224c
224d
224e
224f
224g
224h
241b 残り時間表示欄
216 録音先表示欄
215 ドライブ表示欄
223 ジャンル表示欄
222 アーティスト表示欄
212 録音停止ボタン
231 フィールド

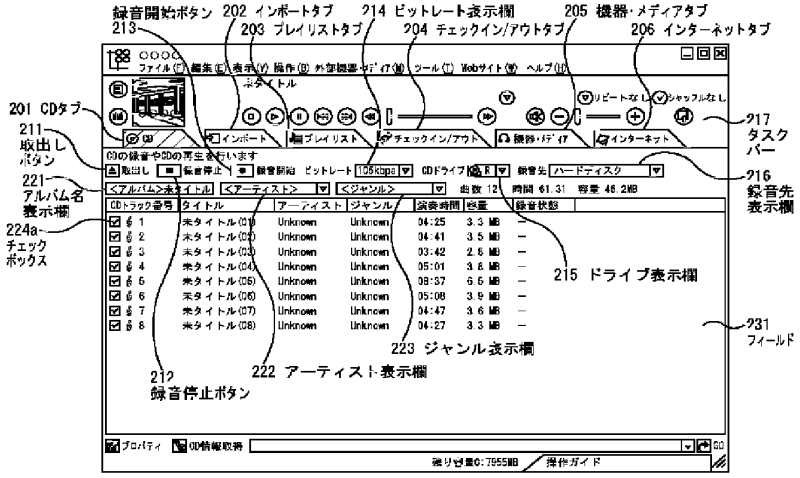
【図１０】


202 インポートタブ
217a
217b
217c
203 プレイリストタブ
204 チェックイン/アウトタブ
205 機器・メディアタブ
206 インターネットタブ
201 CDタブ
217 タスクバー
251 プレイリスト表示欄
952 フィールド
252a プレイリスト表示部
231 フィールド

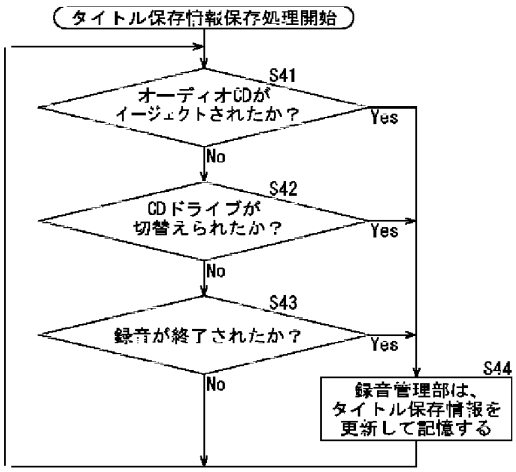
【図１１】


録音開始ボタン 213
202 インポートタブ
203 プレイリストタブ
214 ビットレート表示欄
204 チェックイン/アウトタブ
205 機器・メディアタブ
206 インターネットタブ
201 CDタブ
211 取出しボタン
221 アルバム名表示欄
224a チェックボックス
224b
224c
224d
224e
224f
224g
224h
217c
217 タスクバー
216 録音先表示欄
215 ドライブ表示欄
223 ジャンル表示欄
231 フィールド
264 フィールド
265 フィールド
261 ダイアログボックス
222 アーティスト表示欄
212 録音停止ボタン
262b ボタン
263b キャンセルボタン
263c ヘルプボタン
262a ボタン
263a 録音開始ボタン

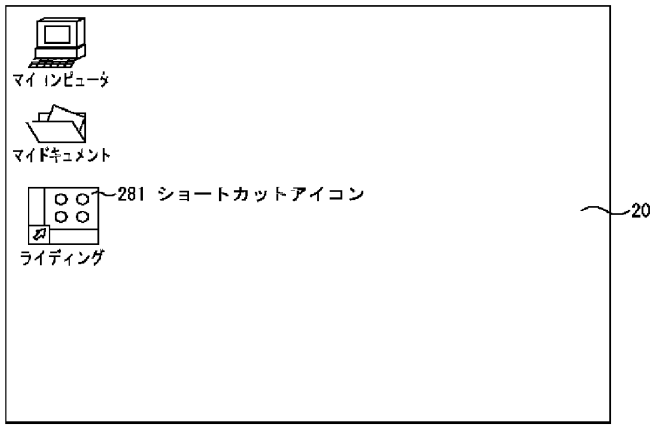
【図１２】


録音開始ボタン 213
202 インポートタブ
203 プレイリストタブ
214 ビットレート表示欄
204 チェックイン/アウトタブ
205 機器・メディアタブ
206 インターネットタブ
201 CDタブ
211 取出しボタン
221 アルバム名表示欄
224a チェックボックス
217 タスクバー
216 録音先表示欄
215 ドライブ表示欄
231 フィールド
223 ジャンル表示欄
222 アーティスト表示欄
212 録音停止ボタン

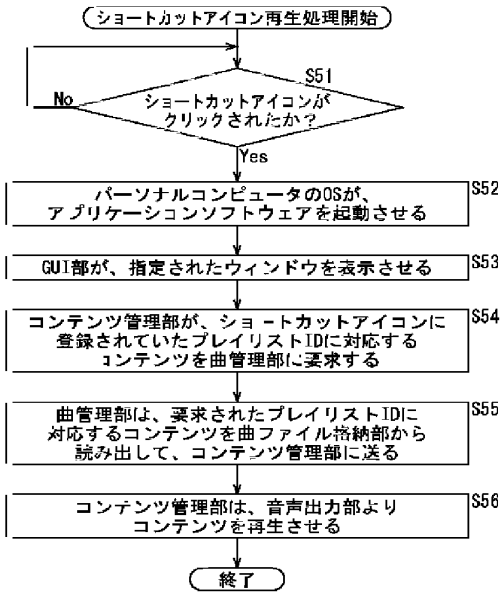
【図１３】




【図１４】




【図１５】




フロントページの続き

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FA13 FA23 FA43 FA46

Espacenet

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## MOBILE PHONE, REPRODUCING METHOD, AND PROGRAM

**Inventor(s):** KOIZUMI MICHIAKI; KIYOTA KENJI ± (KOIZUMI MICHIAKI, ; KIYOTA KENJI)

**Applicant(s):** SANYO ELECTRIC CO ± (SANYO ELECTRIC CO LTD)

**Classification:** **- international:** ***H04M1/00; H04M1/02; H04M1/21; H04M1/725; H04N5/64; H04R5/02; H04R5/04;***
(IPC1-7): H04M1/00; H04M1/02; H04M1/21; H04M1/725; H04N5/64; H04R5/02; H04R5/04

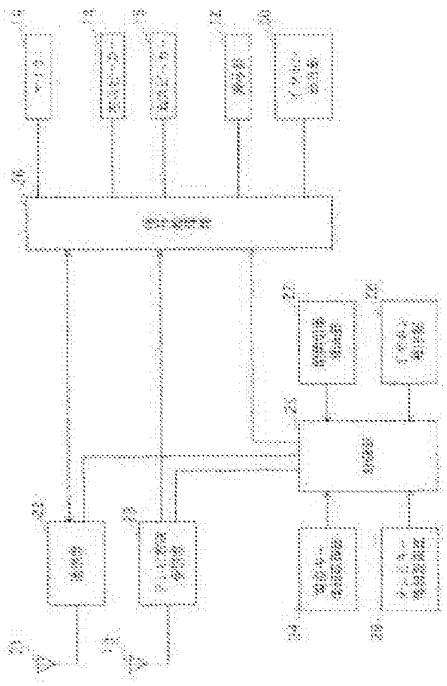
**- cooperative:**

**Application number:** JP20030366952 20031028

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### Abstract of JP2005136457 (A)

PROBLEM TO BE SOLVED: To provide a mobile phone for carrying out a natural sound output to a user whereby the user can easily view a television broadcast program in accordance with the display form of an image in the case of receiving and reproducing the television broadcast wave. ;SOLUTION: The mobile phone is provided with: a reception means for receiving a television broadcast signal; a display section; two speakers arranged at both sides of the display section; and a sound output means for using the two speakers to reproduce the received sound as a stereoscopic signal when the two speakers are located to the left and right of a displayed image or using the speakers to reproduce the received sound as a monaural signal when the two speakers are located to upper and lower parts of the displayed image. ;COPYRIGHT: (C)2005,JPO&NCIPI



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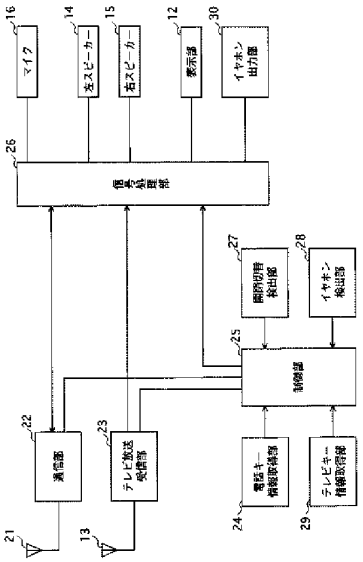
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(54)【発明の名称】携帯電話機、再生方法及びプログラム

(57)【要約】
【課題】　テレビ放送波を受信して再生する場合に、画像の表示形態に応じて、利用者に対し自然な音声出力がなされる、テレビ放送の視聴がしやすい携帯電話機を提供することを目的とする。
【解決手段】　携帯電話機であって、テレビ放送信号を受信する受信手段と、表示部と、表示部の両側に配された２つのスピーカと、前記２つのスピーカが表示画像の左右に位置する場合、受信音声を前記２つのスピーカでステレオ再生し、前記２つのスピーカが表示画像の上下に位置する場合、受信音声を前記２つのスピーカでモノラル再生する音声出力手段とを備える。
【選択図】　図３



【特許請求の範囲】
【請求項1】
テレビ放送信号を受信する受信手段と、
　前記テレビ放送信号中の映像を表示する表示部と、
　前記表示部の両側に配された２つのスピーカと、
　前記２つのスピーカが前記映像の左右に位置する場合、前記テレビ放送信号中の音声を前記２つのスピーカでステレオ再生し、前記２つのスピーカが前記映像の上下に位置する場合、前記音声を前記２つのスピーカでモノラル再生する音声出力手段と
　を備えることを特徴とする携帯電話機。
【請求項2】
表示部の両側に２つのスピーカを配した携帯電話機においてテレビ番組を再生する再生方法であって、
　テレビ放送信号を受信する受信ステップと、
　前記表示部により前記テレビ放送信号中の映像を表示する表示ステップと、
　前記２つのスピーカが前記映像の左右に位置する場合、前記テレビ放送信号中の音声を前記２つのスピーカでステレオ再生し、前記２つのスピーカが前記映像の上下に位置する場合、前記音声を前記２つのスピーカでモノラル再生する音声出力ステップと
　を含むことを特徴とする再生方法。
【請求項3】
表示部の両側に２つのスピーカを配した携帯電話機に適用されるプログラムであって、
　テレビ放送信号を受信する受信ステップと、
　前記表示部により前記テレビ放送信号中の映像を表示する表示ステップと、
　前記２つのスピーカが前記映像の左右に位置する場合、前記テレビ放送信号中の音声を前記２つのスピーカでステレオ再生し、前記２つのスピーカが前記映像の上下に位置する場合、前記音声を前記２つのスピーカでモノラル再生する音声出力ステップと
　の各ステップをコンピュータに実行させるプログラム。

【発明の詳細な説明】
【技術分野】
【0001】
　本発明は、テレビ放送波を受信して再生する携帯電話機に関し、特に音声モードを切替える技術に関する。
【背景技術】
【0002】
　近年、携帯電話機の多機能化が進み、例えばデジタルテレビ放送波を受信、再生する機能を備える携帯電話機も開発されている。
【0003】
　携帯電話機が備える液晶ディスプレイ等画面の形状はほとんどが縦長であり、デジタルテレビ放送波で送信される画像の多くは横長の形状を有するので、携帯電話機の一部機種は、前記画像を９０度回転させて表示し、前記液晶ディスプレイの表示領域を有効利用するモードを備えている（非特許文献１参照）。
【0004】
　一方、音声に関しては、デジタルテレビ放送においてはステレオ放送されるものがほとんどであり、ステレオ音声を適切に再生するためには、携帯電話機にスピーカを２つ備える必要がある。
【0005】
　ステレオ効果を得るために２つのスピーカを適度に離して配置すること及び一方のスピーカを前記縦長画面の上端外側に通常配置される通話用のスピーカと兼用することを考慮し、携帯電話機において、縦長画面の長手方向の両端外側にそれぞれ１つのスピーカを配置することが考えられている。
【非特許文献1】日経エレクトロニクス　２００３年8月１８日　日経ＢＰ社　Ｐ．９０

－９５
【発明の開示】
【発明が解決しようとする課題】
【0006】
しかしながら、前記携帯電話機は、テレビ放送受信時、上述のようには画像を９０度回転させずに画面に表示したい場合もあり、このような場合に受信した音声を単純にステレオ音声として出力すると、ステレオ音声の右音声が画像の上方から聞こえ、左音声が画像の下方から聞こえるといった利用者にとって不自然な音声出力がなされることとなる。
【0007】
上記の問題に鑑み、本発明は、テレビ放送を受信して再生する場合に、画像の表示形態に応じて、利用者に対し自然な音声出力がなされる、テレビ放送の視聴がしやすい携帯電話機を提供することを目的とする。
【課題を解決するための手段】
【0008】
上記課題を解決するために本発明は、携帯電話機であって、テレビ放送信号を受信する受信手段と、前記テレビ放送信号中の映像を表示する表示部と、前記表示部の両側に配された２つのスピーカと、前記２つのスピーカが前記映像の左右に位置する場合、前記テレビ放送信号中の音声を前記２つのスピーカでステレオ再生し、前記２つのスピーカが前記映像の上下に位置する場合、前記音声を前記２つのスピーカでモノラル再生する音声出力手段とを備える。
【発明の効果】
【0009】
（１）本発明の携帯電話機は、上述の構成を備えることにより、利用者から見て、表示する映像の左右にスピーカが位置する場合に、音声をステレオ出力するので、前記利用者は音声のステレオ効果を享受することができ、また表示する映像の左右以外の方向である上下方向等にスピーカが位置する場合、前記スピーカの少なくとも一方に音声をモノラル出力するので、映像の上方向からステレオ音声に係る右側音声、下方向からステレオ音声に係る左側音声を聞くといった不自然さや、聞き取りにくさを感じることなく、音声を聞くことができる。
【0010】
（２）本発明の再生方法は、表示部の両側に２つのスピーカを配した携帯電話機においてテレビ番組を再生する再生方法であって、テレビ放送信号を受信する受信ステップと、前記表示部により前記テレビ放送信号中の映像を表示する表示ステップと、前記２つのスピーカが前記映像の左右に位置する場合、前記テレビ放送信号中の音声を前記２つのスピーカでステレオ再生し、前記２つのスピーカが前記映像の上下に位置する場合、前記音声を前記２つのスピーカでモノラル再生する音声出力ステップとを含む。
【0011】
この構成によれば、利用者から見て、表示する映像の左右にスピーカが位置する場合に、音声をステレオ出力するので、前記利用者は音声のステレオ効果を享受することができ、また表示する映像の左右以外の方向である上下方向等にスピーカが位置する場合、前記スピーカの少なくとも一方に音声をモノラル出力するので、映像の上方向からステレオ音声に係る右側音声、下方向からステレオ音声に係る左側音声を聞くといった不自然さや、聞き取りにくさを感じることなく、音声を聞くことができる。
【0012】
（３）本発明のプログラムは、表示部の両側に２つのスピーカを配した携帯電話機に適用されるプログラムであって、テレビ放送信号を受信する受信ステップと、前記表示部により前記テレビ放送信号中の映像を表示する表示ステップと、前記２つのスピーカが前記映像の左右に位置する場合、前記テレビ放送信号中の音声を前記２つのスピーカでステレオ再生し、前記２つのスピーカが前記映像の上下に位置する場合、前記音声を前記２つのスピーカでモノラル再生する音声出力ステップとの各ステップをコンピュータに実行させ

る。
【0013】
この構成によれば、利用者から見て、表示する映像の左右にスピーカが位置する場合に、音声をステレオ出力するので、前記利用者は音声のステレオ効果を享受することができ、また表示する映像の左右以外の方向である上下方向等にスピーカが位置する場合、前記スピーカの少なくとも一方に音声をモノラル出力するので、映像の上方向からステレオ音声に係る右側音声、下方向からステレオ音声に係る左側音声を聞くといった不自然さや、聞き取りにくさを感じることなく、音声を聞くことができる。
【発明を実施するための最良の形態】
【0014】
本発明の最良の形態について、図を参照しながら説明する。
＜１．概要＞
図１は、本発明に係る携帯電話機１の概略を示す図である。
【0015】
携帯電話機１は、電話としての通話を行う電話機能に加え、テレビ放送波を受信するテレビ機能を備える。
【0016】
携帯電話機１の筐体は、表示部１２を備える第１筐体１０と、第１筐体１０に電気的に接続した第２筐体１１とから成る。
【0017】
携帯電話機１は、スライド開閉式の構造を有し、図１（ａ）に示す第１筐体１０と第２筐体１１とが全体的に重なった状態である閉状態と、図１（ｂ）に示す第１筐体１０が第２筐体１１上を平行移動した開状態との２状態を取る。
【0018】
図１（ａ）に示す第１筐体１０の一部であるスライド部２２には突状のレールが備わり、前記突状レールは、第２筐体１１に備わる溝２１と咬み合っており、溝２１に沿ってスライドする。
【0019】
溝２１の一端には、検出スイッチ２３が備わり、携帯電話機１が前記閉状態の場合には、前記突状レールが検出スイッチ２３を押下する。
【0020】
携帯電話機１は、検出スイッチ２３が押下されていない場合が、開状態であるとする。
【0021】
携帯電話機１の利用者は、電話機能を使用する場合やテレビ放送を簡易視聴する場合には、電話機能の操作に必要なキー等により多様な操作が可能であり、また把持し易い前記開状態で携帯電話機１を利用する。
【0022】
ここで、前記簡易視聴とは、テレビ放送を比較的短い時間視聴することであり、例えば、プロ野球中継における得点のチェック、数分間のニュースの視聴、現在放送中の番組をチェックするためのザッピング視聴等を指す。
【0023】
また、前記利用者は、プロ野球中継を試合終了まで見る、或いはテレビドラマを視聴する等、長時間に渡りテレビを視聴する場合には、携帯電話機１を前記閉状態にして使用する。
【0024】
図２は、携帯電話機１が、受信したテレビ放送を表示部１２に表示している様子を示す図である。
【0025】
図２（ａ）は、前記閉状態の携帯電話機１がテレビ放送を受信し、表示部１２にテレビ映像を映す様子を示している。

【0026】
図２（ｂ）は、前記開状態の携帯電話機１がテレビ放送を受信し、表示部１２にテレビ映像を映す様子を示している。
【0027】
表示部１２は、前記開状態においては、表示すべき情報を、縦長画面として表示し、前記閉状態においては、表示すべき情報を、横長画面として表示する。
【0028】
放送局からテレビ放送される映像は、アスペクト比が横長である映像であり、携帯電話機１は、図２（ａ）に示すように表示部１２一杯に映像を映すよう制御する。
【0029】
横長の映像を前記開状態の携帯電話機１で映す場合には、図２（ｂ）に示すように、前記映像を、図２（ａ）で表示部１２に映されている状態から９０度回転、縮小し、表示部１２に映すこととなり、画面一杯に映像を映すことなく、画面の表示領域を有効利用できない。
【0030】
また、前記利用者は、携帯電話機１を使用しない場合は、携帯電話機１を前記閉状態にしておく。
【0031】
第１筐体１０は、表示部１２と、アンテナ１３と、左スピーカ１４と、右スピーカ１５と、イヤホンジャック１８と、テレビキー２０とを備える。
【0032】
表示部１２は、受信しているテレビ放送や、電話機能による通話時に必要な情報等を表示する液晶ディスプレイ等である。
【0033】
アンテナ１３は、テレビ放送波を受信するアンテナであり、電話機能による通話を行うための無線を送受信するアンテナは、筐体に内蔵されているものとする。
【0034】
左スピーカ１４は、ステレオ音声の左音声や、モノラル音声の出力を行うためのスピーカである。
【0035】
右スピーカ１５は、ステレオ音声の右音声の出力を行うためのスピーカである。
【0036】
テレビキー２０は、当該携帯電話機１の利用者がテレビの視聴を行うために最低限必要なキーを集めたものであり、テレビ放送受信のオン、オフを切り替えるテレビ機能オンオフキー、受信チャネルを選択するためのチャネルアップダウンキー、テレビ音量の調整を行う音量アップダウンキー等から成る。
【0037】
第２筐体１１は、マイク１６と、電話キー１７とを備える。
【0038】
マイク１６は、通話時に、利用者が発する音声を集音する。
【0039】
電話キー１７は、通話先の電話番号を入力するためのテンキーや、オンフックキー、オフフックキーなど通話を行うのに必要なキーから成り、前記テンキーは、テレビ機能がオンになっている場合にはテレビ放送受信時のチャネル番号の入力など、テレビの視聴を行うためのキーとしても使用される。
【0040】
イヤホンジャック１８には、図１（ｂ）に示すようにイヤホン１９の接続が可能である。
【0041】
イヤホンジャック１８は、イヤホンが接続された場合及び接続されたイヤホンが抜かれ

た場合を検出し、また、接続されたイヤホンが、ステレオ用であるかモノラル用であるかを前記イヤホンの接続端子の形状等により識別する。

＜２．構成＞

図３は、携帯電話機１の内部構成を示すブロック図である。

【0042】

表示部１２は、信号処理部２６から入力される、赤色出力信号、緑色出力信号、青色出力信号と、水平、垂直の各同期信号とに基づき、映像表示を行う。

【0043】

通信部２２は、アンテナ２１を介して、携帯電話機に関する基地局（図示せず）と、通話のための無線通信を行う。

【0044】

通信部２２は、受信した信号を復調した結果である音声信号を、信号処理部２６に送信する。

【0045】

テレビ放送受信部２３は、地上波デジタル放送チューナであり、チューナ、復調、誤り訂正、デスクランブル、多重信号分離、復号部、ＤＡコンバータ等から成る。

【0046】

テレビ放送受信部２３は、アンテナ１３を介して、放送局（図示せず）が送信した放送波を受信し、受信した放送波から復号した画像フレーム情報、音声信号を信号処理部２６に出力する。

【0047】

電話キー情報取得部２４は、前記利用者が電話キー１７を押下したことを検出し、押下されたキーに対応する電話キー情報を取得する。

【0048】

信号処理部２６は、前記利用者が通話している場合、通信部２２から受信した音声信号を、増幅処理を施した後、左スピーカ１４に出力する。

【0049】

また、信号処理部２６は、マイク１６が集音した入力音声を増幅処理し、通信部２２、アンテナ２１を介して、前記基地局に送信する。

【0050】

信号処理部２６は、前記利用者がテレビ放送を視聴する場合、テレビ放送受信部２３から受信した映像信号を、前記映像信号を表示部１２に表示させる。

【0051】

信号処理部２６は、制御部２５からの出力制御指示により、前記左音声信号と前記右音声信号とを、左スピーカ１４と右スピーカ１５とを用いて出力するか、又は前記左音声信号と、前記右音声信号とを合成してモノラル音声とし、左スピーカ１４に出力する。

【0052】

信号処理部２６は、ＶＲＡＭ（Ｖｉｄｅｏ　Ｒａｎｄｏｍ　Ａｃｃｅｓｓ　Ｍｅｍｏｒｙ）とワークＲＡＭとを備える。

【0053】

信号処理部２６は、テレビ放送受信部２３から画像フレーム情報を取得する。

【0054】

前記画像フレーム情報は、例えば、ビットマップのように１枚の画像を符号化したものである。

【0055】

信号処理部２６は、取得した画像フレーム情報を、ＶＲＡＭへ書き込む。

【0056】

但し、信号処理部２６は、制御部２５から画像を９０度回転させるよう指示を受けている場合には、前記受信した画像フレーム情報が示す画像を９０度回転させた画像をワークＲＡＭを用いて生成し、前記回転させた画像フレーム情報を前記ＶＲＡＭに展開する。

【0057】
信号処理部２６は、前記ＶＲＡＭ中の情報に対応する、赤出力信号、緑出力信号、青出力信号と、同期信号とを表示部１２に出力する。
【0058】
開閉切替検出部２７は、検出スイッチ２３が押下されている場合に、携帯電話機１が前記閉状態であると判定し、押下されていない場合には携帯電話機１が前記開状態であると判定し、携帯電話機１のテレビ機能がオンされた場合と、携帯電話機１が前記閉状態から前記開状態に変わった場合と、前記開状態から前記閉状態に変わった場合とに、制御部２５に対し携帯電話機１が閉状態と開状態のいずれであるかを示す開閉情報を送信する。
【0059】
また、開閉切替検出部２７は、携帯電話機１の電源がオンになった場合にも、携帯電話機１が開状態と閉状態のいずれであるかを検出し、検出結果を開閉情報として、制御部２５に対し出力する。
【0060】
イヤホン検出部２８は、イヤホンジャック１８にイヤホンが接続された場合及び接続されたイヤホンが抜き取られた場合に、イヤホンが接続されているか否か、接続されている場合には当該イヤホンがステレオ音声用であるかアナログ音声用であるかを判定し、前記判定結果に基づきイヤホン無、ステレオ、アナログのいずれかを示すイヤホン情報を、制御部２５に出力する。
【0061】
また、イヤホン検出部２８は、携帯電話機１の電源がオンになった場合にも、上述の通りイヤホンの接続有無、接続されたイヤホンの種類を判定し、判定結果をイヤホン情報として、制御部２５に対し送信する。
【0062】
テレビキー情報取得部２９は、前記利用者によるテレビキー２０の押下を検出し押下されたキーに対応するテレビキー情報を取得する。
【0063】
イヤホン出力部３０は、信号処理部２６から出力される音声信号を、イヤホンジャック１８に接続されたイヤホンに対し、出力する。
【0064】
制御部２５は、開閉切替検出部２７から取得する開閉情報と、イヤホン検出部２８から取得するイヤホン情報とから、音声モード判定処理を行い、判定結果を出力制御情報として、信号処理部２６に出力する。
【0065】
前記音声モード判定処理については、後述する。
【0066】
制御部２５は、受信したテレビキー情報に基づき、テレビ放送受信部２３に対するチューニングの指示、信号処理部２６に対する音声出力のゲイン調整指示、テレビ放送に係る映像の出力指示等を行う。
【0067】
制御部２５は、受信したキー情報に応じて、電話機能を動作させるため、通信部２２に対し無線通信を行うよう指示する。
【0068】
制御部２５は、携帯電話機１の主電源がオンされた場合には、イヤホン情報、開閉情報を、初期値として取得しておく。
＜３．動作＞
制御部２５は、音声モード判定処理を、（ａ）テレビ機能がオフからオンに変更された場合、（ｂ）イヤホンの接続、抜き取りを検出した場合、（ｃ）携帯電話機１の開閉状態が変更された場合の３つの場合に行う。
【0069】

図４は、音声モード判定処理の内容を示すフローチャートである。

【0070】

制御部２５は、前記イヤホン情報がステレオ或いはモノラルを示すか否かを判定する（Ｓ４０１）。

【0071】

制御部２５は、前記イヤホン情報がイヤホン無を示す場合（Ｓ４０１：ＮＯ）、Ｓ４０２に進む。

【0072】

制御部２５は、前記イヤホン情報がステレオ或いはモノラルを示す場合（Ｓ４０１：ＹＥＳ）、左スピーカ１４及び右スピーカ１５への音声出力を停止するスピーカミュートを示す出力制御指示を信号処理部２６に送信し（Ｓ４０５）、前記イヤホン情報がステレオを示す場合（Ｓ４０６：ＹＥＳ）、イヤホンステレオ出力を示す出力制御指示を信号処理部２６に送信する（Ｓ４０７）。

【0073】

前記イヤホン情報がモノラルを示す場合（Ｓ４０６：ＮＯ）、イヤホンモノラル出力を示す出力制御指示を信号処理部２６に対し送信する（Ｓ４０８）。

【0074】

制御部２５は、前記開閉情報が開状態を示す場合（Ｓ４０２：ＹＥＳ）、信号処理部２６に対し左スピーカモノラル出力を示す出力制御指示を出力する（Ｓ４０４）。

【0075】

前記開閉状態が閉状態を示す場合（Ｓ４０２：ＮＯ）、信号処理部２６に対し、両スピーカステレオ出力を示す出力制御指示を信号処理部２６に対し出力する（Ｓ４０３）。

【0076】

なお、制御部２５は、電話機能がオンになった場合には、イヤホン情報がイヤホン無しを示すか否かを判定する。

イヤホン情報が、イヤホン無しを示す場合左スピーカ出力を示す出力制御情報を信号処理部２６に対し送信し、イヤホン情報がモノラル及びステレオを示す場合には、イヤホンモノラル出力を示す出力制御指示を信号処理部２６に対し送信する。

【0077】

信号処理部２６は、制御部２５から受信した出力制御指示に従い、音声出力を行う。

＜４．変形例＞

なお、本発明を上記の実施の形態に基づいて説明してきたが、本発明は、上記の実施の形態に限定されないのはもちろんである。

以下のような場合も本発明に含まれる。

【0078】

本発明について、スライド式で開閉する携帯電話機の例で説明してきたが、映像を所定の角度回転させるなどしてスピーカの位置と、映像の上下との対応関係が変化するように構成されてあれば、本発明の適用は可能である。

【0079】

図５は、回転式構造を有する携帯電話機の概略を示す図である。

【0080】

例えば、図５（ａ）及び（ｂ）に示す携帯電話機のように、第１筐体１０１が、第２筐体１０２に対して９０度回転する回転式の構造を有してもよい。

【0081】

図５に示す携帯電話機においては、第１筐体１０１が回転したような図５（ａ）で示した状態が前記閉状態に相当し、左スピーカ１０４及び右スピーカ１０５が、ステレオ音声を出力する。

【0082】

図５（ｂ）で示した状態は前記開状態に相当し、ステレオ音声をモノラル音声に変換した後、左スピーカ１０４又は右スピーカ１０５の少なくとも一方から前記モノラル信号を

出力する。

【0083】

また、水平及び垂直ジャイロセンサーにより、携帯電話機の姿勢を検出し、利用者から見て、２つのスピーカが表示部の左右に位置する場合と、表示部の上下に位置する場合とを検出する構成としてもよい。

【図面の簡単な説明】

【0084】

【図1】本発明に係る携帯電話機１の概略を示す図である。

【図2】携帯電話機１が、テレビ放送を受信し、表示部１２に表示している様子を示す図である。

【図3】携帯電話機１の内部構成を示すブロック図である。

【図4】音声モード判定処理の内容を示すフローチャートである。

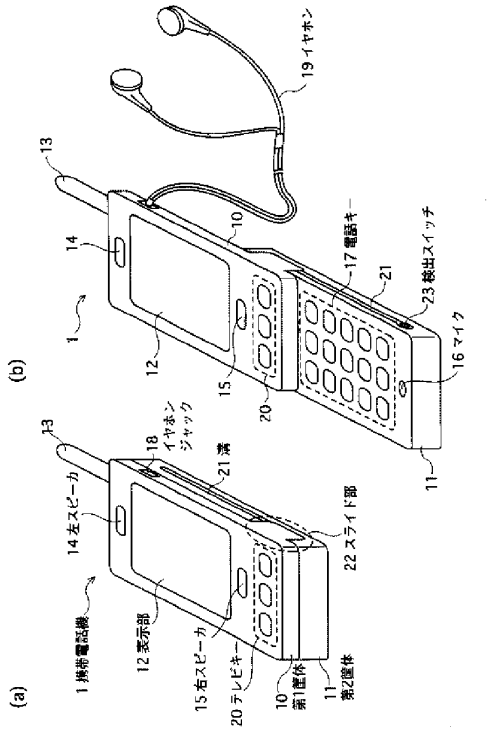
【図5】回転式構造を有する携帯電話機の概略を示す図である。

【符号の説明】

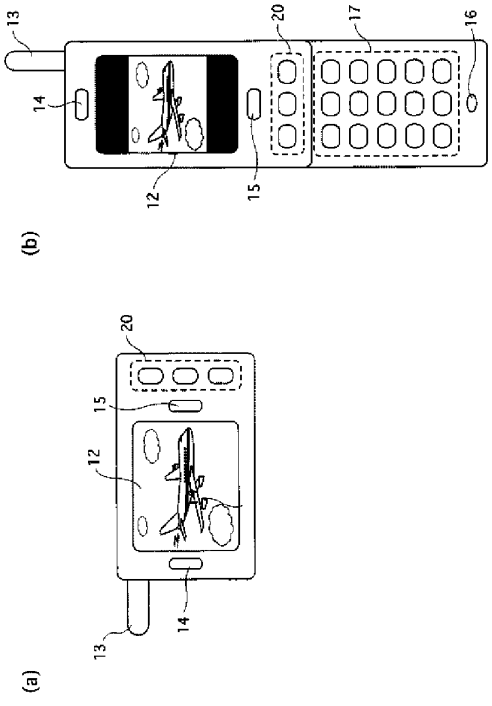
【0085】

１　携帯電話機
１０　第１筐体
１１　第２筐体
１２　表示部
１４　左スピーカ
１５　右スピーカ
１７　電話キー
２０　テレビキー
２１　溝
２３　検出スイッチ

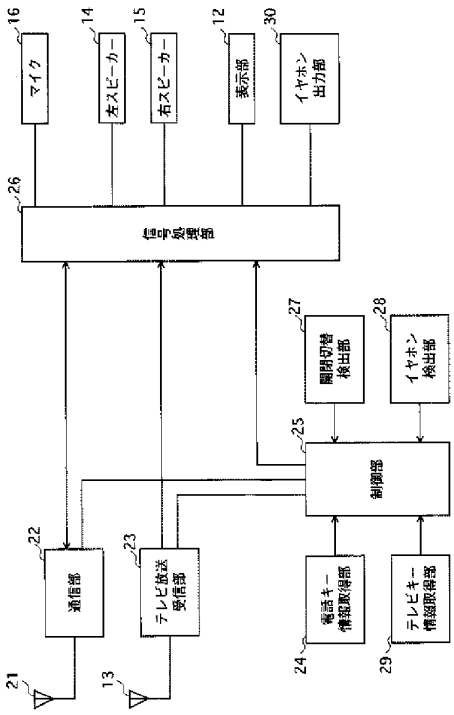
【図1】



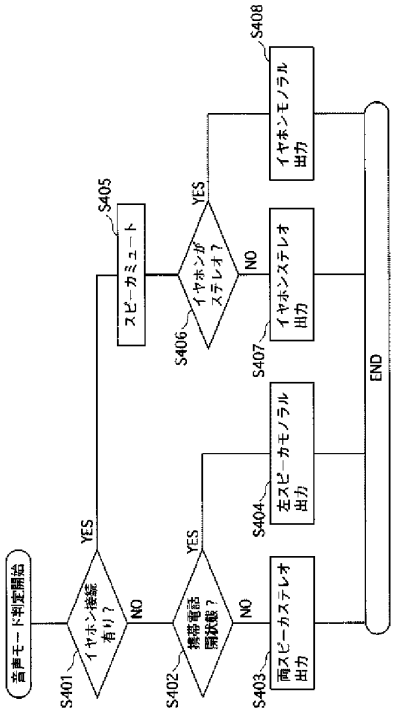

【図2】



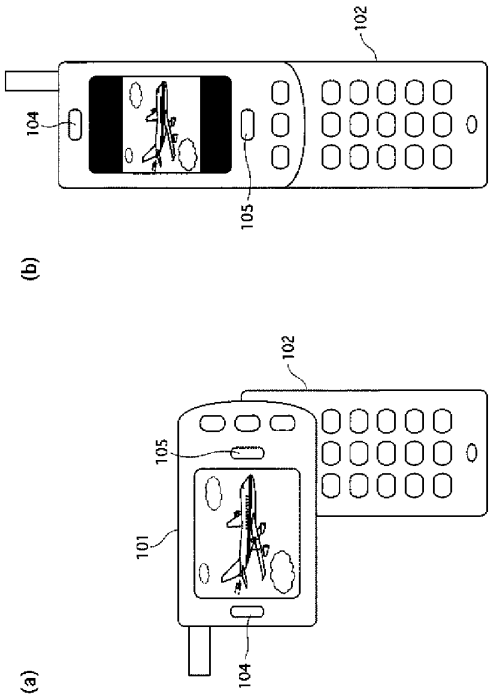
【図3】


マイク
左スピーカー
右スピーカー
表示部
イヤホン出力部
信号処理部
開閉切替検出部
イヤホン検出部
制御部
通信部
テレビ放送受信部
電話キー情報取得部
テレビキー情報取得部

【図4】


音声モード判定開始
イヤホン接続有り？
スピーカミュート
イヤホンがステレオ？
イヤホンモノラル出力
イヤホンステレオ出力
携帯電話開状態？
左スピーカモノラル出力
両スピーカステレオ出力
END
YES
NO

【図5】


(a)
(b)

| (51)Int.Cl.[7] | FI | | | テーマコード（参考） |
|---|---|---|---|---|
| Ｈ０４Ｒ　5/02 | Ｈ０４Ｍ | 1/725 | | |
| // Ｈ０４Ｎ　5/64 | Ｈ０４Ｒ | 5/02 | Ｚ | |
| | Ｈ０４Ｎ | 5/64 | ５３１ | |
| | Ｈ０４Ｎ | 5/64 | ５４１Ｎ | |

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# Bibliographic data: JP2007241652 (A) — 2007-09-20

## CONTENT DISTRIBUTION SYSTEM

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**Applicant(s):** CORE COLORS INC ± (CORE COLORS INC)

**Classification:** **- international:** ***G06F13/00; G10K15/02; H04N21/258; H04N21/262; H04N21/482; H04N7/173***

**- cooperative:**

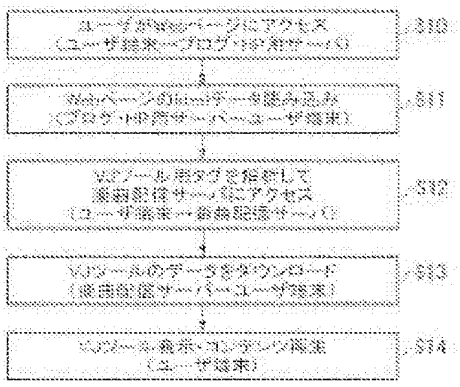
**Application number:** JP20060063096 20060308

**Priority number(s):** JP20060063096 20060308

### Abstract of JP2007241652 (A)

PROBLEM TO BE SOLVED: To provide a content distribution system which enables a user to freely edit the combination of music and images and share edited contents with other users. ;SOLUTION: The content distribution system relating to this embodiment is constituted of a content distribution server 10, a user terminal 20 and a server 30 for blogs/HP connected through a network 50. The content distribution server 10 includes a database for storing the program of a reproduction tool for reproducing the contents in which the image is clipped to the music, music data, image data, a music play list indicating the music selected by the user from the music and a clipping setting specifying the image to be clipped to the music. The user terminal 20 reproduces the contents according to the music play list and the clipping setting downloaded from the server. ;COPYRIGHT: (C)2007,JPO&INPIT

[図4]



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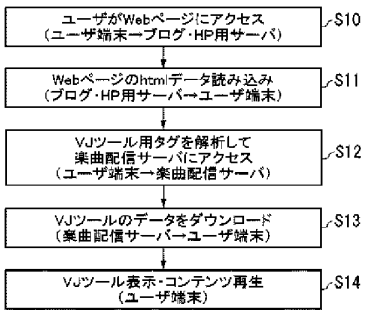
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Ｆターム(参考)　5C164 FA12 MA02S MA07S MC07S SC11P SC28P UB94S UD54P YA08

(54)【発明の名称】コンテンツ配信システム

(57)【要約】
【課題】　楽曲と映像の組み合わせをユーザが自由に編集できると共に、編集したコンテンツを他のユーザと共有することも可能なコンテンツ配信システムを提供する。
【解決手段】　本実施の形態に係るコンテンツ配信システムは、ネットワーク５０を介して接続されたコンテンツ配信サーバ１０、ユーザ端末２０及びブログ・ＨＰ用サーバ３０とから構成される。コンテンツ配信サーバ１０は、楽曲に映像がクリッピングされたコンテンツを再生するための再生ツールのプログラムと、楽曲データと、映像データと、楽曲の中からユーザが選択した楽曲を示す楽曲プレイリストと、楽曲にクリッピングされる映像を特定したクリッピング設定と、を格納するデータベースを備えており、ユーザ端末２０は、サーバからダウンロードした楽曲プレイリスト及びクリッピング設定に従って、コンテンツの再生を行う。
【選択図】　図４

【図4】



【特許請求の範囲】
【請求項1】
ネットワークを介して接続されたコンテンツ配信サーバ、ユーザ端末及びＷｅｂページ用サーバを備え、ユーザに対して楽曲に映像がクリッピングされたコンテンツを配信するサービスを提供するコンテンツ配信システムであって、
前記コンテンツ配信サーバは、
前記コンテンツを再生するための再生ツールのプログラムを格納するプログラムデータベースと、
前記コンテンツの素材となる楽曲データを格納する楽曲データベースと、
前記コンテンツの素材となる映像データを格納する映像データベースと、
前記楽曲の中からユーザが選択した楽曲を示す楽曲プレイリストと、ユーザが設定した前記楽曲プレイリスト中の楽曲にクリッピングされる映像を特定したクリッピング設定と、を各ユーザに関連付けて格納する設定情報データベースと、を備え、
前記Ｗｅｂページ用サーバは、所定のＷｅｂページにおいて、前記楽曲プレイリスト及び前記クリッピング設定に従ったコンテンツを前記再生ツールにより再生するための再生ツール用タグが埋め込まれたＨＴＭＬデータを記憶する記憶手段を備え、
前記ユーザ端末は、前記所定のページにアクセスした際に前記再生ツール用タグを解析し、前記コンテンツ配信サーバにアクセスして前記コンテンツを再生する演算手段を備えたことを特徴とするコンテンツ配信システム。
【請求項2】
前記クリッピング設定には、前記楽曲に前記映像をクリッピングするタイミングを示す情報が含まれていることを特徴とする請求項１記載のコンテンツ配信システム。
【請求項3】
前記設定情報データベースには、前記コンテンツが提供されているＷｅｂページのＵＲＬ情報に関連付けて、前記楽曲プレイリスト及び前記クリッピング設定が格納されており、
前記再生ツール用タグは、このタグが埋め込まれたＷｅｂページのＵＲＬ情報を前記コンテンツ配信サーバに送信するためのスクリプトを含んでおり、
前記コンテンツ配信サーバは、前記再生ツール用タグを解析してアクセスしてきたユーザ端末に対して、取得した前記ＵＲＬ情報に関連付けられている前記楽曲プレイリスト及び前記クリッピング設定を送信するように構成されていることを特徴とする請求項１又は２記載のコンテンツ配信システム。
【請求項4】
ネットワークを介してコンテンツ配信サーバに接続されたユーザ端末を使用するユーザに対して、所定のＷｅｂページにおいて、楽曲に映像がクリッピングされたコンテンツを提供するコンテンツ配信方法であって、
前記ユーザ端末が、前記所定のＷｅｂページを提供するＷｅｂページ用サーバにアクセスし、前記Ｗｅｂページ用サーバが保持する前記所定のＷｅｂページを構築するＨＴＭＬデータ内に挿入されている再生ツール用タグであって、前記コンテンツ配信サーバが保持する前記コンテンツを再生するためのデータにアクセスするための再生ツール用タグを解析する解析工程と、
解析の結果に基づき、前記ユーザ端末が、前記コンテンツ配信サーバにアクセスし、前記コンテンツに含まれる楽曲を示す楽曲プレイリストと、前記楽曲プレイリスト中の楽曲にクリッピングされる映像を特定したクリッピング設定とをダウンロードするダウンロード工程と、
前記ユーザ端末が、前記楽曲プレイリスト及び前記クリッピング設定に従って、楽曲に映像がクリッピングされたコンテンツを再生する再生工程と、
を備えたことを特徴とするコンテンツ配信方法。
【請求項5】

ネットワークを介して接続されたユーザ端末を使用するユーザに対して、所定のＷｅｂページにおいて、楽曲に映像がクリッピングされたコンテンツを提供するコンテンツ配信サーバであって、
前記コンテンツを再生するための再生ツールのプログラムを格納するプログラムデータベースと、
前記コンテンツの素材となる楽曲データを格納する楽曲データベースと、
前記コンテンツの素材となる映像データを格納する映像データベースと、
前記楽曲の中からユーザが選択した楽曲を示す楽曲プレイリストと、ユーザが設定した前記楽曲プレイリスト中の楽曲にクリッピングされる映像を特定したクリッピング設定と、を各ユーザに関連付けて格納する設定情報データベースと、
前記コンテンツが提供されるホームページで前記コンテンツを再生するために、当該ホームページを構築するＨＴＭＬデータ内に挿入される再生ツール用タグであって、前記コンテンツ配信サーバの前記プログラムデータベース、前記楽曲データベース、前記映像データベース、前記設定情報データベースにアクセスするための情報が記述された再生ツール用タグを発行する発行手段と、を備えていることを特徴とするコンテンツ配信サーバ。
【請求項6】
楽曲に映像がクリッピングされたコンテンツを再生するコンピュータであって、
前記コンテンツの素材である複数の楽曲データと、前記コンテンツの素材である複数の映像データと、前記複数の楽曲データの中から選択された楽曲を特定する楽曲プレイリストと、前記楽曲にクリッピングされる映像及びクリッピングされるタイミングが設定されたクリッピング設定と、を記憶する記憶手段と、
前記楽曲プレイリスト及び前記クリッピング設定に従って、所定の楽曲に所定の映像をクリッピングしながら前記コンテンツの再生を行う演算手段と、を備えたことを特徴とするコンピュータ。
【発明の詳細な説明】
【技術分野】
【0001】
本発明は、インターネット等のネットワークに接続されたコンピュータに楽曲等のコンテンツを配信するコンテンツ配信システムに関し、特に、楽曲に映像をクリッピングしたコンテンツを配信するコンテンツ配信システムに関する。
【背景技術】
【0002】
従来、ネットワークを介して、クライアント端末のパソコンに種々の音楽データを配信し、パソコン上でストリーミング再生させる音楽配信システムが数多く提案されている。
【0003】
ところが、従来の音楽配信システムは、単に、サーバに保存されている楽曲の中からユーザによって選択された曲のデータが端末に送信されて、端末上で再生されるだけであり、エンターテイメント性に欠けていた。
【0004】
また、インターネット上では、インターネット放送局も提供されており、放送局のサイトにアクセスしたユーザに対して、音楽、映像等をネット上で放送配信するサービスが提供されているが、これも、多数のユーザに対して、画一的なコンテンツを提供するに過ぎなかった。
【0005】
そこで、エンターテイメント性を向上させるべく、ユーザ毎に設定されたユーザプロファイル情報やプレイリスト情報に基づき、各ユーザに異なる音楽や映像のコンテンツをネット配信し、ユーザ端末上で再生させる配信システムが、下記特許文献に開示されている。
【特許文献1】特表２００５－５３１２０５号公報
【特許文献2】特表２００５－５３５９７９号公報
【発明の開示】

【発明が解決しようとする課題】
【0006】
しかしながら、上記特許文献１及び特許文献２に記載の装置においては、予め作成されサーバに格納されている音楽や映像等のコンテンツの中から、所定のコンテンツを所定の順序でユーザ端末に配信するだけであり、ユーザがコンテンツを編集したり、また、編集したコンテンツを他のユーザに配信したりするといったことはできない。
【0007】
本発明は、このような課題を解決するためになされたものであり、楽曲と映像の組み合わせをユーザが自由に編集できると共に、編集したコンテンツを他のユーザと共有することも可能なコンテンツ配信システムを提供することを目的とする。
【課題を解決するための手段】
【0008】
上記課題を解決するために、本発明に係るコンテンツ配信システムは、ネットワークを介して接続されたコンテンツ配信サーバ、ユーザ端末及びＷｅｂページ用サーバを備え、ユーザに対して楽曲に映像がクリッピングされたコンテンツを配信するサービスを提供するコンテンツ配信システムであって、前記コンテンツ配信サーバは、前記コンテンツを再生するための再生ツールのプログラムを格納するプログラムデータベースと、前記コンテンツの素材となる楽曲データを格納する楽曲データベースと、前記コンテンツの素材となる映像データを格納する映像データベースと、前記楽曲の中からユーザが選択した楽曲を示す楽曲プレイリストと、ユーザが設定した前記楽曲プレイリスト中の楽曲にクリッピングされる映像を特定したクリッピング設定と、を各ユーザに関連付けて格納する設定情報データベースと、を備え、前記Ｗｅｂページ用サーバは、所定のＷｅｂページにおいて、前記楽曲プレイリスト及び前記クリッピング設定に従ったコンテンツを前記再生ツールにより再生するための再生ツール用タグが埋め込まれたＨＴＭＬデータを記憶する記憶手段を備え、前記ユーザ端末は、前記所定のページにアクセスした際に前記再生ツール用タグを解析し、前記コンテンツ配信サーバにアクセスして前記コンテンツを再生する演算手段を備えたことを特徴とする。
【0009】
また、本発明に係るコンテンツ配信方法は、ネットワークを介してコンテンツ配信サーバに接続されたユーザ端末を使用するユーザに対して、所定のＷｅｂページにおいて、楽曲に映像がクリッピングされたコンテンツを提供するコンテンツ配信方法であって、前記ユーザ端末が、前記所定のＷｅｂページを提供するＷｅｂページ用サーバにアクセスし、前記Ｗｅｂページ用サーバが保持する前記所定のＷｅｂページを構築するＨＴＭＬデータ内に挿入されている再生ツール用タグであって、前記コンテンツ配信サーバが保持する前記コンテンツを再生するためのデータにアクセスするための再生ツール用タグを解析する解析工程と、解析の結果に基づき、前記ユーザ端末が、前記コンテンツ配信サーバにアクセスし、前記コンテンツに含まれる楽曲を示す楽曲プレイリストと、前記楽曲プレイリスト中の楽曲にクリッピングされる映像を特定したクリッピング設定とをダウンロードするダウンロード工程と、前記ユーザ端末が、前記楽曲プレイリスト及び前記クリッピング設定に従って、楽曲に映像がクリッピングされたコンテンツを再生する再生工程と、を備えたことを特徴とする。
【0010】
また、本発明に係るコンテンツ配信サーバは、ネットワークを介して接続されたユーザ端末を使用するユーザに対して、所定のＷｅｂページにおいて、楽曲に映像がクリッピングされたコンテンツを提供するコンテンツ配信サーバであって、前記コンテンツを再生するための再生ツールのプログラムを格納するプログラムデータベースと、前記コンテンツの素材となる楽曲データを格納する楽曲データベースと、前記コンテンツの素材となる映像データを格納する映像データベースと、前記楽曲の中からユーザが選択した楽曲を示す楽曲プレイリストと、ユーザが設定した前記楽曲プレイリスト中の楽曲にクリッピングされる映像を特定したクリッピング設定と、を各ユーザに関連付けて格納する設定情報デー

タベースと、前記コンテンツが提供されるホームページで前記コンテンツを再生するために、当該ホームページを構築するＨＴＭＬデータ内に挿入される再生ツール用タグであって、前記コンテンツ配信サーバの前記プログラムデータベース、前記楽曲データベース、前記映像データベース、前記設定情報データベースにアクセスするための情報が記述された再生ツール用タグを発行する発行手段と、を備えていることを特徴とする。

また、本発明に係るコンピュータは、楽曲に映像がクリッピングされたコンテンツを再生するコンピュータであって、前記コンテンツの素材である複数の楽曲データと、前記コンテンツの素材である複数の映像データと、前記複数の楽曲データの中から選択された楽曲を特定する楽曲プレイリストと、前記楽曲にクリッピングされる映像及びクリッピングされるタイミングが設定されたクリッピング設定と、を記憶する記憶手段と、前記楽曲プレイリスト及び前記クリッピング設定に従って、所定の楽曲に所定の映像をクリッピングしながら前記コンテンツの再生を行う演算手段と、を備えたことを特徴とする。

【発明の効果】

【0011】

本発明に係るコンテンツ配信システムによれば、楽曲と映像の素材データの組み合わせをユーザが指定するという簡単な方法で、楽曲に所定の映像がクリッピングされたコンテンツを作成し、公開することことが可能である。また、楽曲と素材の組み合わせを変更するという簡単な方法で、公開されているコンテンツを編集し、編集したコンテンツを公開することができる。

【発明を実施するための最良の形態】

【0012】

以下、添付図面を参照しながら本発明の実施の形態について詳細に説明する。図１は、本実施の形態に係るコンテンツ配信システム１の概略構成を示す図である。同図に示すように、コンテンツ配信システム１は、コンテンツ配信を提供するための種々のデータが格納されているコンテンツ配信サーバ１０と、コンテンツ配信サービスを利用するユーザが使用するパソコン等の複数のユーザ端末２０と、ユーザが自分で編集したコンテンツを公開するためのホームページ（ＨＰ）やブログ（Ｂｌｏｇ）等を構築するHTMLデータが格納されているブログ・ＨＰ用サーバ３０と、を備えている。これらコンテンツ配信サーバ１０、ユーザ端末２０及びブログ・ＨＰ用サーバ３０は、インターネット等のネットワーク５０を介して接続されており、それぞれの通信インターフェースを介して、互いにデータの送受信が可能である。

【0013】

本実施形態に係るコンテンツ配信システム１は、ユーザのホームページやブログ等のＷｅｂページを構築するHTML（Hypertext Markup Language）データ内に、映像がクリッピングされた楽曲を編集・再生するためのアプリケーションであるＶＪ（Visual Jockey又はVideo Jockey）ツール用のHTMLタグを埋め込んでおくことで、ユーザが当該Ｗｅｂページにアクセスして、楽曲に映像をクリッピングしたＶＪコンテンツを作成・編集をしたり、当該Ｗｅｂページにアクセスしたユーザがこのコンテンツを視聴したりする機能を、Ｗｅｂページ内に実装するように構成されている。

【0014】

また、このＶＪコンテンツは、楽曲と映像が合体した一つのコンテンツファイルとして作成されるのではなく、ＶＪコンテンツを作成するユーザは、ＶＪコンテンツ用の素材である楽曲データの中からＶＪコンテンツとして使用したい楽曲を選択した楽曲プレイリストと、同じく素材としての映像データの中から楽曲プレイリスト中の楽曲にクリッピングしたい映像及びクリッピングするタイミング（映像の切り替えタイミングを含む）を設定したクリッピング設定と、を作成するだけで良い。

【0015】

よって、本システムによれば、ユーザは、ディスクジョッキー（ＤＪ）やＶＪのように、楽曲に好みの映像をクリッピングしたＶＪコンテンツを手軽に作成できると共に、自分のＷｅｂページ上で公開して他のユーザに披露することができる。また、作成したＶＪコ

ンテンツの編集も、楽曲プレイリストやクリッピング設定を変更するだけで、手軽に行うことが可能である。なお、本実施形態に係るＶＪツールは、Flash（登録商標）を利用したFlashプレーヤであるが、Java（登録商標）、ActiveX（登録商標）等を利用して実装するようにしても良い。

【0016】

コンテンツ配信サーバ１０は、コンテンツ配信サービスを提供する事業者が設置するサーバであり、各種演算を行うための図示しない演算装置と、各種データを記憶しておくための記憶装置とを備えるコンピュータによって構成されている。図２は、コンテンツ配信サーバ１０の記憶装置に格納されているデータベース（ＤＢ）１１の内容を示す図である。同図に示すように、ＤＢ１１には、楽曲ＤＢ１１１、映像ＤＢ１１２、ユーザＤＢ１１３、ステーションＤＢ１１４、楽曲プレイリストＤＢ１１５、クリッピング設定ＤＢ１１６、プログラムＤＢ１１７が含まれている。

【0017】

楽曲ＤＢ１１１は、コンテンツ配信サービスにおいて提供される楽曲の素材データを格納するＤＢである。楽曲ＤＢ１１１内の各楽曲レコードには、各楽曲を識別するための「楽曲ＩＤ」、「楽曲データ」、「アーティスト名」、「楽曲名」、「楽曲ジャンル」等の情報が含まれている。映像ＤＢ１１２は、コンテンツ配信サービスにおいて、ユーザがＶＪ編集する際に楽曲にクリッピングされる映像の素材データを格納するＤＢである。映像ＤＢ１１２内の各映像レコードには、各映像を識別するための「映像ＩＤ」、「映像データ」等の情報が含まれている。なお、本実施形態では、楽曲ＤＢ１１１内の楽曲データは、ＭＰ３形式のデータを採用しているが、これに限られるものではなく、ＷＭＡ、ＡＡＣ等、適宜他の形式の音楽ファイルを採用しても良い。

【0018】

ユーザが設定した設定情報を保持するデータベースであるユーザＤＢ１１３～クリッピング設定ＤＢ１１６については、図３を参照しながら説明する。図３は、ユーザＤＢ１１３、ステーションＤＢ１１４、楽曲プレイリストＤＢ１１５及びクリッピング設定ＤＢ１１６に記録されている各レコードの内容を示す図である。

【0019】

ユーザＤＢ１１３は、コンテンツ配信サービスを利用する登録ユーザに関する情報を格納するＤＢである。図３に示すように、ユーザＤＢ１１３の各ユーザレコードには、各ユーザを識別するための「ユーザＩＤ」と「パスワード」の情報が格納されている。このパスワードは、コンテンツ配信サービスの登録ユーザがサービスにログインする際のログイン認証で使用されるものであり、登録時にユーザが設定したものである。

【0020】

ステーションＤＢ１１の各レコードには、「ステーションＩＤ」、「ユーザＩＤ」、「ＵＲＬ」の情報が格納されている。「ステーションＩＤ」とは、「ＵＲＬ」の設定に基づき振り分けられるものであり、同じステーションＩＤを有するＷｅｂページに実装されているＶＪツールには、同じ楽曲プレイリスト及びクリッピング設定が割り当てられることになる。

【0021】

ステーションの設定・変更は、ユーザがユーザ端末２０からコンテンツ配信サーバ１０へアクセスし、ＵＲＬを設定・変更・追加等することで、適宜行うことができるように構成されている。例えば、あるユーザが、ＵＲＬ「http://fogma.net/」 にステーションＡを設定すると、後述する同じＶＪツール用タグにより、「http://fogma.net/」以下の全てのＷｅｂページのＶＪツールに、ステーションＡの楽曲プレイリスト及びこの楽曲プレイリスト内の楽曲に対するクリッピング設定が配信されることになる。また、さらに、同じユーザが、ＵＲＬ「http://fogma.net/stationB/」にステーションＢを設定すると、「http://fogma.net/stationB/」以下のＷｅｂページのＶＪツールには、ステーションＢに楽曲プレイリスト及びこの楽曲プレイリスト内の楽曲に対するクリッピング設定が配信され、それ以外のＷｅｂページのＶＪツールには、ステーションＡのものが配信されること

になる。

【0022】

このように、本コンテンツ配信システムでは、ユーザは、自分のブログサイト及びホームページ等、複数のＷｅｂページにＶＪツールを実装可能であり、ページ毎に異なるＶＪコンテンツの公開を行うことが可能である。

【0023】

楽曲プレイリストＤＢ１１５内の各レコードには、「ユーザＩＤ」、「ステーションＩＤ」、「楽曲ＩＤ」の情報が格納されている。楽曲プレイリストとは、各ステーションのＶＪツールにおいて、再生される楽曲のリストを表すものである。「楽曲ＩＤ」には、楽曲ＤＢ１１１に格納されている曲の中からユーザが選択した楽曲ＩＤが演奏される順に保持されている。もちろん、楽曲プレイリスト中の楽曲が１つであっても良い。

【0024】

クリッピング設定ＤＢ１１６内の各レコードには、「ユーザＩＤ」、「楽曲ＩＤ」、「クリッピング設定」の情報が格納されている。「クリッピング設定」とは、各ステーションのＶＪツールにおいて楽曲が再生される際に、同ツール内に楽曲と一緒に表示される映像及び当該映像を表示するタイミングを設定した情報であり、各ユーザの楽曲毎に設定されている。本コンテンツ配信システム１では、タイミングを指定して楽曲の再生中に映像を切り替えたり、映像を切り替える際にエフェクトをかけたりすることが可能であり、「クリッピング設定」には、当該ＶＪツールの楽曲プレイリストに記録されている楽曲毎に、表示される映像の映像ＩＤが切り替えのタイミング、すなわち何秒から何秒まで当該映像を表示するかの情報と共に保持されている。また、映像を切り替える際のエフェクト情報も保持されている。

【0025】

ここで、エフェクトとしては、映像Ａから映像Ｂに徐々に映像が切り替わる「フェードイン」、映像Ａから映像Ｂに瞬時に映像が切り替わる「カットイン」、映像Ａの上に映像Ｂを所定期間重ね合わせる「パートイン」等がある。もちろん、適宜、その他のエフェクトを設定できるようにしても良い。

【0026】

この「クリッピング設定」も、後述する編集モードにおいて、映像ＤＢ１１２に格納されている映像の中から、タイミングと共にユーザが設定するものである。また、当該ＶＪツールに設定されている楽曲プレイリストの楽曲が複数の場合には、楽曲毎にクリッピング設定が行われる。なお、ユーザがクリッピング設定を行っていない場合には、この「クリッピング設定」の欄は空白となる。

【0027】

プログラムＤＢ１１７は、本コンテンツ配信サービスを提供するために必要な各種プログラムを格納するＤＢである。例えば、上述したＶＪツールのアプリケーションプログラムや、ユーザのサービス登録処理、サービスにログインするユーザの認証等を行う際のプログラムが格納されている。

【0028】

ユーザ端末Ａ２０－１、ユーザ端末Ｂ２０－２、…、は、本コンテンツ配信サービスを利用するユーザが使用するパソコン等の端末であり、ディスプレイ、ＰＣ本体、キーボード、マウス等を備えており、ＰＣ本体は、図示しない演算装置や記憶装置を備えている。もちろん、ユーザ端末としては、ＰＣに限らず、ＶＪツールを使用でき、ネットワークに接続してコンテンツ配信サーバ１０と通信できる端末であれば、ＰＤＡ、携帯電話、ゲーム端末等、その他のコンピュータであっても良い。

【0029】

ブログ・ＨＰ用サーバＡ３０－１、ブログ・ＨＰ用サーバＢ３０－２、…、は、ホームページやブログを開設しているユーザの加入するプロバイダ（ＩＳＰ）が所有するサーバや、ユーザが自宅に設置しているＷｅｂサーバ等である。この、ブログ・ＨＰ用サーバ３０は、図示しない演算装置や記憶装置を備えており、この記憶装置内には、ブログやＨＰ

を構築するHTMLデータが保存されている。なお、本実施形態では、ユーザ端末２０とブログ・ＨＰ用サーバ３０を別々のコンピュータで構成したものとして説明しているが、ユーザが自宅のパソコンをＷｅｂサーバとして使用している場合等、単一のコンピュータに、ユーザ端末及びＷｅｂサーバとしての機能を持たせるようにしても良い。

【0030】

このHTMLデータ内には、ＶＪツールをユーザのＷｅｂページ内に実装するためのＶＪツール用タグが埋め込まれている。このＶＪツール用タグは、例えば、『<script type="text/javascript" language="javascript" src="http://fogma.net/ID001000000001"></script>』と記述される。このように、このＶＪツール用タグには、コンテンツ配信サーバ１０のアドレス、当該Ｗｅｂページにおいて ＶＪツールを提供しているユーザのユーザＩＤが含まれている。なお、このＶＪツール用タグは、ユーザが最初に本コンテンツ配信サービスに入会した際に、コンテンツ配信サーバ１０によって発行される。発行の形態は、入会時にコンテンツ配信サーバ１０が提供する登録ページ上に表示されるようにしても良いし、ユーザに対してこのＶＪツール用タグが記載されたメールを送信するようにしても良い。これらの処理は、プログラムＤＢ１１７内の所定のプログラムをコンテンツ配信サーバ１０の演算装置が実行することで実現される。

【0031】

ＶＪツール用タグを取得したユーザは、自分が提供しているＷｅｂページを構築するHTMLデータ内に、このタグを記述する。このＶＪツール用タグが挿入されたHTMLデータは、ブログ・ＨＰ用サーバ３０内の記憶装置に格納され、当該Ｗｅｂページにアクセスしたユーザのユーザ端末２０上には、ＶＪツールが実装されたページが表示されることになる。

【0032】

以上のような構成において、ＶＪツールが埋め込まれているＷｅｂページにアクセスしたユーザのユーザ端末２０は、端末にインストールされているブラウザがこのＶＪツール用タグを解析することで、コンテンツ配信サーバ１０にアクセスし、ＶＪツールのプログラム、当該ステーションの楽曲プレイリスト、クリッピング設定等のデータをコンテンツ配信サーバ１０からダウンロードする。これにより、ユーザ端末２０のディスプレイ上には、ＶＪツールが表示され、当該Ｗｅｂページを開設しているユーザによって編集された映像クリッピング付き楽曲（ＶＪコンテンツ）が端末上で再生されることになる。なお、ＶＪツールのプログラムは、一度、ユーザ端末２０にダウンロードされた後は、ユーザ端末２０内の記憶装置に格納しておき、次回からは、毎回サーバからダウンロードするのではなく、ユーザ端末２０内に格納されているＶＪツールのプログラムを使用するようにしても良い。

【0033】

以上、本実施形態に係るコンテンツ配信システム１の構成について説明したが、続いて、本コンテンツ配信システムを用いてＶＪ編集されたコンテンツをユーザが視聴する際の処理の流れの詳細について説明する。図４は、本実施形態に係るコンテンツ配信システム１においてユーザがコンテンツを視聴する際の処理の流れを示すフローチャートである。

【0034】

まず、ステップ１０（Ｓ１０）において、コンテンツを視聴したいユーザが、自分のユーザ端末２０を使って、ＶＪツールが埋め込まれているＷｅｂページにアクセスする。すなわち、当該ユーザのユーザ端末２０が、ネットワーク５０を介して、ブログ・ＨＰ用サーバ３０にアクセスする。そうすると、Ｓ１１において、ブログ・ＨＰ用サーバ３０の記憶装置に格納されているＷｅｂページのHTMLデータが、当該ユーザのユーザ端末２０にダウンロードされる。

【0035】

続いて、Ｓ１２では、ユーザ端末２０の演算装置が取得したHTMLデータを解析し、当該Ｗｅｂページのコンテンツをディスプレイ上に表示するように処理する。このとき、HTMLデータ内のＶＪツール用タグもユーザ端末２０によって解析され、ＶＪツール用タグを解

析したユーザ端末２０は、タグ内にアドレスが記載されているコンテンツ配信サーバ１０へとアクセスする。上述したように、ＶＪツール用タグには、当該Ｗｅｂページに ＶＪコンテンツを公開しているユーザのユーザＩＤ記述されており、ユーザ端末２０は、ユーザＩＤを特定したうえで、コンテンツ配信サーバ１０へとアクセスする。

【0036】

コンテンツ配信サーバ１０にアクセスしたユーザ端末２０には、Ｓ１３において、コンテンツ配信サーバ１０のＤＢ１１から、当該Ｗｅｂページに ＶＪツールを表示して ＶＪコンテンツを再生するためのデータがダウンロードされる。このデータには、ＶＪツールのプログラム本体と、当該Ｗｅｂページを公開しているユーザによって設定された楽曲プレイリスト及びクリッピング設定と、当該楽曲プレイリスト及びクリッピング設定に設定されている楽曲及び映像データと、が含まれている。

【0037】

このとき、そのユーザＩＤのユーザが複数のステーションを設定している場合には、コンテンツ配信サーバ１０が、アクセスしてきたユーザ端末２０がどこのＷｅｂページのＶＪツールにアクセスしたかを上記ＶＪツール用タグに挿入されているスクリプトを用いてＵＲＬで把握し、当該ＵＲＬに割り振られているステーションＩＤをステーションＤＢ１４から抽出し、これのステーションＩＤに関連付けられている楽曲プレイリスト及びクリッピング設定をユーザ端末２０へ送信するように処理する。

【0038】

また、楽曲プレイリストに複数の楽曲が設定されている場合には、Ｓ１３においては、最初の楽曲データのみがダウンロードされ、残りの楽曲については、前の楽曲の再生中にダウンロードされるように構成されており、コンテンツの再生開始までの時間が短縮されている。また、クリッピング設定に複数の映像がクリッピングされている場合も、順次、ＶＪコンテンツの再生に必要な映像がダウンロードされるように構成されている。もちろん、一曲分の楽曲データが最初に全てダウンロードされるのではなく、ストリーミング再生されるように、最初の１０数秒程度の楽曲データがダウンロードされた時点でコンテンツの再生を開始し、残りはコンテンツを再生しながら順次ダウンロードされるように構成すれば、さらに最初のコンテンツ再生までの時間を短縮できる。映像データについても同様である。

【0039】

なお、楽曲及び映像データについては、Ｓ１３で送信されるのではなく、ユーザ端末１０が楽曲プレイリスト及びクリッピング設定を解析した後で、再度、コンテンツ配信サーバ１０へアクセスしてダウンロードされるように、サーバ側のプログラムを構成しても良い。

【0040】

続いて、Ｓ１４に進み、ユーザ端末２０の演算装置が、ダウンロードしたＶＪツールのプログラムを実行し、ディスプレイのＷｅｂページ内にＶＪツールを表示し、ダウンロードした楽曲プレイリスト及びクリッピング設定に従って、楽曲に映像がクリッピングされたＶＪコンテンツを再生する。ユーザは、ユーザ端末２０のスピーカから流れる楽曲を聴きながら、ディスプレイに表示される映像を楽しむことができる。なお、クリッピング設定がされていないステーションのＶＪツールにおいては、映像ＤＢ１１４からランダムに映像が選択され、ＶＪツールに表示されるように構成されている。

【0041】

図５は、Ｓ１４において、Ｗｅｂページ上に表示されるＶＪツール（通常モード）の内容を示す図である。同図に示すように、ＶＪツール画面の中心に映像が表示され、図示はしていないが、右下部分には、楽曲名、アーティスト名、楽曲のジャンルが横方向にスクロールしながら表示されるウィンドウが配置されている。

【0042】

また、このウィンドウの下には、演奏されている楽曲のお気に入り度を５段階の星の数（ランク１～ランク５）で評価する評価欄（RATE）が配置されており、ユーザがユーザ端

末２０のマウスで所望の段階をクリックすることで、当該ユーザの当該楽曲に対する評価を行うことができる。この評価情報は、ユーザＩＤと楽曲ＩＤと関連づけられたうえで、コンテンツ配信サーバ１０のユーザＤＢ１１１内に格納されるように構成されており（図３では不図示）、この評価情報を利用して種々のサービスをユーザに提供することが可能である。

【0043】

例えば、あるＷｅｂページ上のＶＪコンテンツを視聴しているユーザに対して、当該ユーザが過去にランク１又はランク２の評価をした楽曲を、当該Ｗｅｂページに設定されているＶＪコンテンツの楽曲プレイリストから除いて再生するといったことや、反対に、そのＶＪコンテンツの楽曲プレイリストの中から、当該ユーザがランク４又はランク５と評価した楽曲のみを取り出して再生するといった処理を行うことが可能である。このような処理は、コンテンツ配信サーバ１０内のプログラムを書き換えることで実現可能である。

【0044】

また、ＶＪコンテンツをＷｅｂページ上で公開しているユーザに対しては、当該ＶＪコンテンツを視聴したユーザの楽曲毎の評価を定期的に提示することが可能であり、今後のＶＪコンテンツ作成に生かしてもらうこともできる。

【0045】

なお、この評価情報のサービスは、コンテンツ配信サービスに登録してユーザＩＤを取得しているユーザのみが利用可能である。ユーザＩＤを取得しているユーザは、ＶＪツールが埋め込まれているＷｅｂページに最初にアクセスした時に表示されるログインアイコン（図６参照）をクリックすると、ログインウィンドウが表示されるので、このログインウィンドウにユーザＩＤ及びパスワードを入力することで、ログインモードに移行し、評価情報サービスや、後述する編集モードを利用することができる。

【0046】

このとき、ユーザＩＤ及びパスワードの入力を受け付けたユーザ端末２０は、コンテンツ配信サーバ１０にアクセスし、ユーザＤＢ１１１を参照して、ログイン認証を行う。一度、ログイン認証を行うと、ユーザ端末２０内にcookie情報として記録されるので、その後は、当該ユーザが同じ端末を使ってＶＪツールが埋め込まれたＷｅｂページにアクセスしたとしてもログイン認証を行う必要はない。

【0047】

さらに、ＶＪツールの上述したウィンドウの右上部分には、モード切替アイコンが表示されており、他人のＶＪコンテンツを視聴しているユーザが、このボタンをマウスでクリックすることにより、編集モードに切り替えることが可能である。図７は、編集モードの際にユーザ端末２０のディスプレイに表示されるＶＪツールの表示内容を示す図である。

【0048】

同図に示すように、編集モードでは、ＶＪツールの下側部分に、映像素材リストが表示されており、その左側には、サブ映像ウィンドウが表示されている。この映像素材リストには、映像ＤＢ１１２内に格納されている各映像データの一画面が複数表示されている。この映像素材リストの端部をクリックすることで、順次、他の映像素材リストに切り替えることが可能である。ユーザが、映像素材リストの中から所望の映像素材をクリックすると、その映像データが若干拡大されてサブ映像ウィンドウに表示される。ＶＪツールに表示される映像を切り替えたい場合には、サブ映像ウィンドウをクリックすれば、ＶＪツールに表示される映像が、サブ映像ウィンドウに表示されていた映像に切り替わる。

【0049】

通常、ＶＪツール内の映像は、当該ＶＪコンテンツを作成したユーザが設定したクリッピング設定に従って表示されるが、このように、編集モードにおいては、ＶＪコンテンツを視聴しているユーザが、適宜、ＶＪツール内の映像を自分の好みの映像に切り替えることも可能である。

【0050】

映像素材リストの上側には、エフェクトを設定するためのエフェクトリストのアイコン

が表示されており、所望のアイコンをクリックすることで、クリッピング映像が切り替わる際のエフェクトを所望のエフェクトに設定することも可能である。本実施形態では、上述したように、「フェードイン」、「カットイン」又は「パートイン」のエフェクトを設定可能である。

【0051】

次に、本実施形態に係るコンテンツ配信システム１において、ユーザがＶＪツールを用いて、自己のＷｅｂページ上で公開する映像がクリッピングされた楽曲データを編集するＶＪ編集モードにおける処理の流れについて説明する。図８は、ＶＪ編集モードにおける処理の流れを示すフローチャートである。このＶＪ編集モードには、自分のＶＪコンテンツにアクセスしているユーザが、上記モード切替アイコンをクリックすることで移行できる。

【0052】

なお、ＶＪ編集モードにおいても、図４に示したＳ１０～Ｓ１４までの流れは同じであるが、ＶＪ編集モードにおいては、Ｓ１０で、ユーザがＶＪツール用タグを埋め込んだ自分のＷｅｂページにアクセスする必要がある。また、最初のＶＪコンテンツ作成時には、Ｓ１３及びＳ１４については、楽曲プレイリスト及びクリッピング設定が設定されていないため実行されない。

【0053】

Ｓ２０において、まず、上述したようにユーザ認証が行われる。もし、既にユーザ認証が行われており、認証記録が当該ユーザのユーザ端末２０にcookieとして保存されている場合には、Ｓ２０はスキップされる。

【0054】

続いて、Ｓ２１において、ユーザによってＶＪ編集が行われる。ＶＪ編集では、新規ＶＪコンテンツ作成時には、楽曲プレイリスト及びクリッピング設定が新規に設定され、既に作成されているＶＪコンテンツを編集する場合には、楽曲プレイリスト及びクリッピング設定の変更が行われる。

【0055】

楽曲プレイリストの設定においては、ユーザ端末２０のディスプレイ上に、図示しない楽曲選択画面に楽曲ＤＢ１１１内に格納されている楽曲素材データの一覧が表示されるので、ユーザが所望の順序で楽曲を指定することで設定される。設定された楽曲プレイリストは、ユーザＩＤ及びステーションＩＤに関連付けられた楽曲プレイリストとして、コンテンツ配信サーバ１０の楽曲プレイリストＤＢ１１５に格納される。

【0056】

クリッピング設定においては、楽曲プレイリストに従って順次楽曲が再生されている際に、リアルタイムでユーザがクリッピング設定を行う。このとき、上記図７に示した編集モードと同じ画面がユーザ端末２０上に表示されるので、同様の手法によって、ユーザが楽曲にクリッピングする映像及び映像切り替え時のエフェクトを選択すれば良い。但し、ＶＪ編集モードにおいては、エフェクトリストの右側に「クリップ録画ボタン」（図７では不図示）が表示されるので、ユーザは、このボタンをクリックすることで、クリッピング設定を開始することができる。

【0057】

このとき、ＶＪツールにより、ユーザが操作した、楽曲中のどこでどの映像をクリッピングするかの情報及び映像を切り替える際にどのエフェクトを用いるかの情報が、クリッピング設定情報として、ユーザ端末２０からコンテンツ配信サーバ１０へと送られ、ユーザＩＤ及び楽曲ＩＤに関連付けられ、クリッピング設定ＤＢ１１６内に格納される。

【0058】

なお、ＶＪ編集モードにおいて、あるユーザがクリッピング設定を行っている際に、再生されている楽曲の楽曲ＩＤと、編集されているクリッピング設定情報とを、当該ユーザのＷｅｂページにアクセスしている他のユーザのユーザ端末にリアルタイムで配信するように構成すれば、他のユーザは、ライブで当該ユーザの編集しているＶＪコンテンツを視

聴することが可能である。このとき、当該ユーザのユーザ端末２０から送信される情報は、楽曲ＩＤとクリッピング設定のデータだけであり、楽曲及び映像データ本体は、サーバから他のユーザの端末に配信されることになるので、当該ユーザ端末のトラフィックに負荷をかけることなく、効率良くライブ配信が可能である。

【0059】

以上、詳細に説明した本実施形態によれば、楽曲データと映像データが独立したデータとして管理されており、端末側において、クリッピング設定に従って楽曲データに映像データをクリッピングすることでＶＪコンテンツの再生を実現しており、その後の編集も容易な自由度の高いコンテンツ配信システムを提供することができる。すなわち、音声と映像とがミックスした一つのファイルとして作成されたＶＪコンテンツであれば、一度作成した後は、作成したユーザがその内容を後で変更することや、ＶＪコンテンツを視聴しているユーザが自分好みにクリップ映像を変更したりすることはできないが、本実施形態によれば、容易にＶＪコンテンツの変更・編集が可能である。

【0060】

また、ユーザは、自分のＷｅｂページにＶＪツール用のタグを埋め込むだけで、コンテンツ配信サーバ内に保存されている楽曲及び映像データを利用して、ユーザ端末で手軽にＶＪコンテンツを作成することができる共に、作成したＶＪコンテンツを簡単にＷｅｂページ上に公開でき、他のユーザと共有することが可能である。また、既に作成したＶＪコンテンツの修正・編集も、ユーザ端末を使って容易に行うことができ、修正・編集作業を行うだけで、自動的にＷｅｂページ上の公開ＶＪコンテンツも更新されることになる。

【0061】

なお、本発明の実施形態は、上述した形態に限定されるものではなく、本発明の趣旨を逸脱しない範囲内で種々の変形が可能である。例えば、本実施形態においては、楽曲及び映像データをコンテンツ配信サーバ内に格納し、ＶＪコンテンツを再生するたびに、サーバからユーザ端末へとデータを送信するように構成したが、ユーザ端末側にも楽曲及び映像データを格納するように構成しても良い。ユーザ端末側に格納しておけば、ＶＪコンテンツを再生したり編集したりするたびに、データをダウンロードする必要がなく、ＶＪコンテンツ再生・編集の際の通信トラフィックを減らして、処理スピードを上げることができる。

【0062】

また、本実施形態においては、ユーザが複数のＷｅｂページにＶＪツールを埋め込んでいる場合に、それぞれのＷｅｂページ毎に異なるＶＪコンテンツを提供できるように、楽曲プレイリスト及びクリッピング設定を、ユーザＩＤに加えてＷｅｂページを特定するためのステーションＩＤに関連付けて、楽曲プレイリスト及びクリッピング設定をユーザＤＢに格納するように構成したが、Ｗｅｂページ毎に異なるＶＪコンテンツを提供する必要がない場合等には、ユーザＩＤにのみ関連付けて格納するように構成しても良い。

【0063】

また、楽曲及び映像データに加えて、楽曲プレイリスト及びクリッピング設定のデータをユーザ端末側にも保存するようにすれば、ネットワークに接続していないオフラインのときでも、自分で作成したＶＪコンテンツを手軽楽しむことができる。なお、この場合には、自分で作成したＶＪコンテンツを他のユーザと共有することはできない。但し、オンライン時に、サーバ上とユーザ端末上の楽曲プレイリスト及びクリッピング設定のデータ同期を行えるように構成しておけば、オンライン時には、オフライン時に作成、編集したＶＪコンテンツを、他のユーザと共有できるようになる。

【0064】

また、ＰＤＡ、携帯電話、携帯オーディオプレーヤ等のモバイル端末に、ＶＪツールのプログラム、楽曲データ、映像データ、楽曲プレイリスト及びクリッピング設定をダウンロードできるように構成しても良い。このようにすれば、ＶＪコンテンツを持ち運んで、様々な場所で楽しむこと可能である。

【0065】

また、例えば、ユーザ端末とモバイル端末をケーブルやネットワークを介して接続した際に、ユーザ端末内のＶＪコンテンツに関するデータと、モバイル端末内の同データとを同期するように構成しておけば、ユーザは、ユーザ端末で作成したＶＪコンテンツや、他のユーザのＷｅｂページ上で見つけたお気に入りのＶＪコンテンツを手軽にモバイル端末で楽しむことが可能である。

【図面の簡単な説明】

【0066】

【図1】図１は、本実施の形態に係るコンテンツ配信システム１の概略構成を示す図である。

【図2】図２は、コンテンツ配信サーバの記憶装置に格納されているデータベース（ＤＢ）の内容を示す図である。

【図3】図３は、ユーザＤＢ、ステーションＤＢ、楽曲プレイリストＤＢ及びクリッピング設定ＤＢに記録されているレコードの内容を示す図である。

【図4】図４は、コンテンツ配信システムにおいてユーザがコンテンツを視聴する際の処理の流れを示すフローチャートである。

【図5】図５は、ＶＪツールの通常モードの表示内容を示す図である。

【図6】図６は、ＶＪツールのログインアイコンを示す図である。

【図7】図７は、ＶＪツールの編集モードの表示内容を示す図である。

【図8】図８は、ＶＪ編集モードにおける処理の流れを示すフローチャートである。

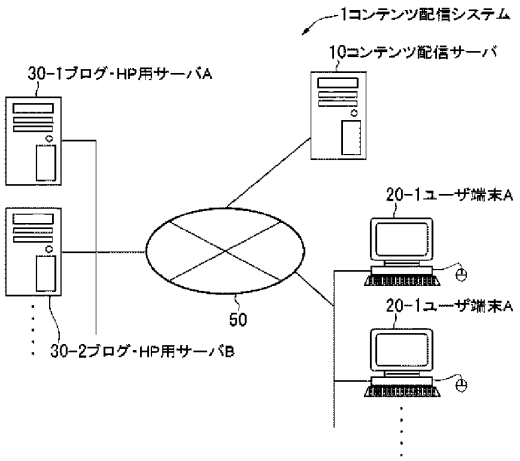
【符号の説明】

【0067】

１　　コンテンツ配信システム
１０　　コンテンツ配信サーバ
１１　　ＤＢ
２０　　ユーザ端末
３０　　ブログ・ＨＰ用サーバ
５０　　ネットワーク

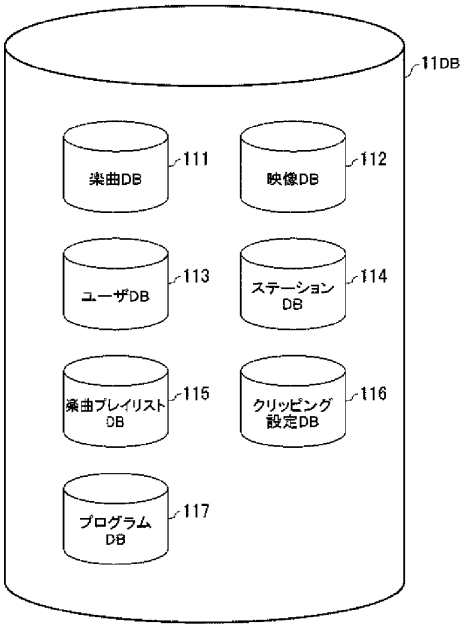
【図1】

【図1】




【図2】

【図2】




【図3】

【図3】

111ユーザDB

| ユーザID | パスワード |
|---|---|

114ステーションDB

| ステーションID | ユーザID | URL |
|---|---|---|

115楽曲プレイリストDB

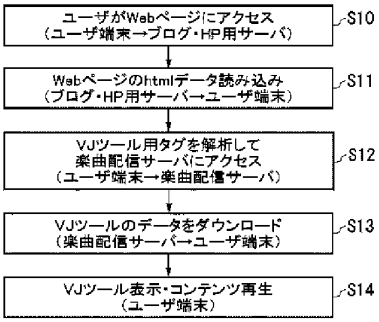
| ユーザID | ステーションID | 楽曲ID |
|---|---|---|

116クリッピング設定DB

| ユーザID | 楽曲ID | クリッピング設定 |
|---|---|---|

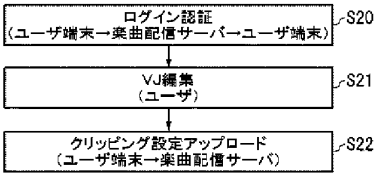
【図4】

【図4】



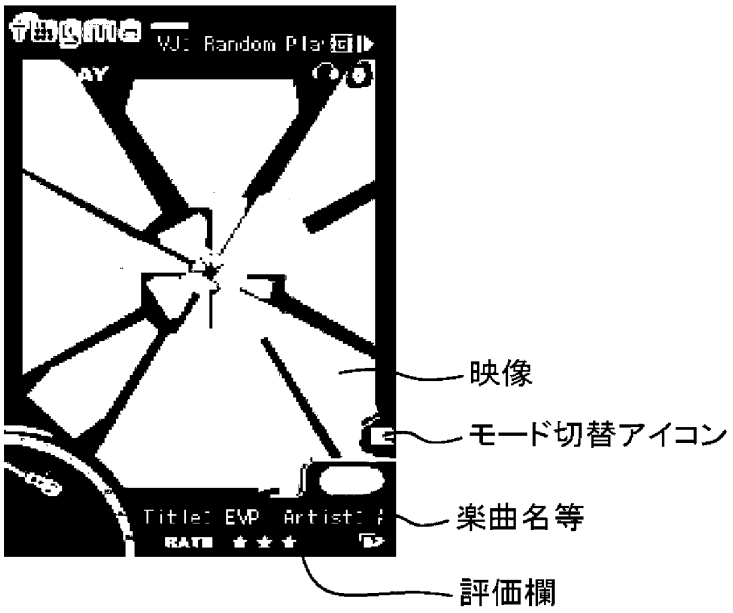

【図8】

【図8】



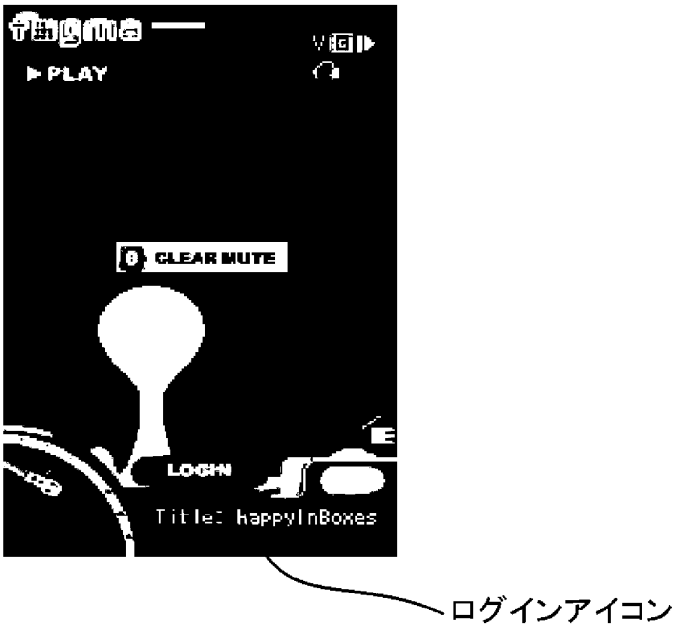
【図5】

【図5】



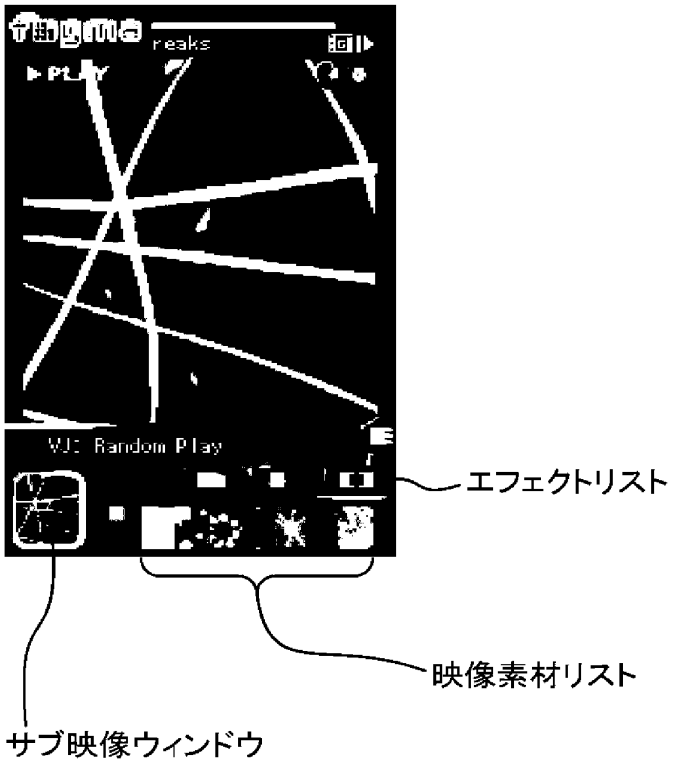
【図6】

【図6】



【図7】

【図7】



Espacenet

# Bibliographic data: JP2009135750 (A) — 2009-06-18

## REPRODUCTION SYSTEM, REPRODUCTION CONTROL DEVICE, REPRODUCTION CONTROL METHOD AND REPRODUCTION CONTROL PROGRAM


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**Applicant(s):** KYOCERA CORP ± (KYOCERA CORP)



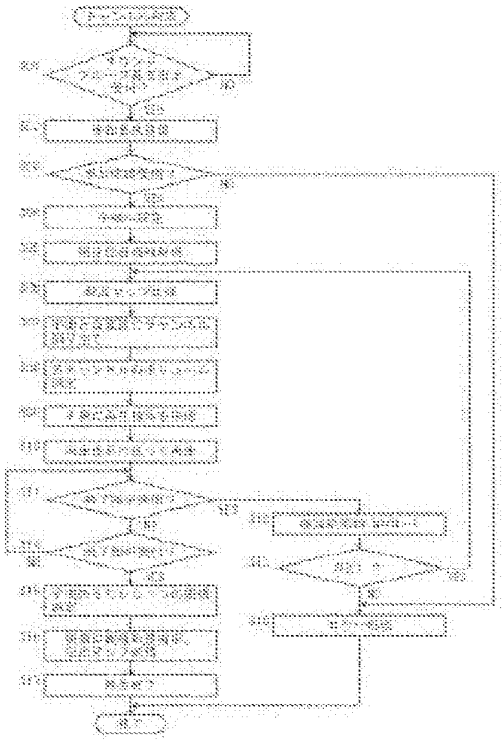
**Classification:** **- international:** ***H04M1/00; H04S5/02***
**- cooperative:**

**Application number:** JP20070310187 20071130

**Priority number(s):** JP20070310187 20071130


### Abstract of JP2009135750 (A)


PROBLEM TO BE SOLVED: To reproduce a sound with presence. ;SOLUTION: The reproduction system is composed of a plurality of mobile phones, and each of the plurality of mobile phones comprises an AV decoder for reproducing sound data of 5.1 channel, a GPS sensor for detecting a current location, and a wireless LAN circuit for communicating with any other mobile phone among the plurality of mobile phones. A master unit of one of the plurality of mobile phones comprises: location acquiring means (S03, S05) for acquiring locations of the plurality of mobile phones; an assignment means (S08) for assigning one or more channels of a plurality of channels to the plurality of mobile phones, respectively, based on locations of the plurality of mobile phones; and reproduction instruction means (S09, S10) for reproducing sound data of the one or more channels assigned to the plurality of mobile phones, respectively. ;COPYRIGHT: (C)2009,JPO&INPIT

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| H04M | 1/00 | (2006.01) | H04S | 5/02 | L | 5K027 |
| | | | H04M | 1/00 | V | |

審査請求 未請求　請求項の数 7　ＯＬ　（全 16 頁）

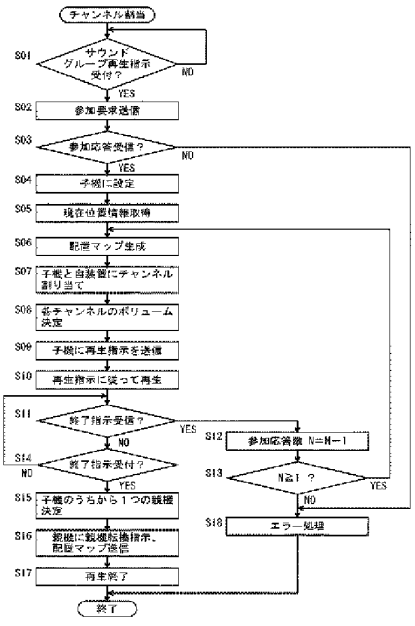
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5K027 AA11　BB01　DD14　DD16　HH01
HH26

(54)【発明の名称】再生システム、再生制御装置、再生制御方法および再生制御プログラム

(57)【要約】
【課題】　臨場感のある音を再生すること。
【解決手段】　再生システムは、複数の携帯電話機からなり、複数の携帯電話機それぞれは、５．１チャンネルの音声データを再生するためのＡＶデコーダと、現在位置を検出するＧＰＳセンサと、複数の携帯電話機のうち他の携帯電話機と通信するための無線ＬＡＮ回路と、を備え、複数の携帯電話機のうち１の親機は、複数の携帯電話機それぞれの位置を取得する位置取得手段（Ｓ０３，Ｓ０５）と、複数の携帯電話機それぞれの位置に基づいて、複数の携帯電話機それぞれに複数チャンネルのうちの１以上のチャンネルを割り当てる割当手段（Ｓ０８）と、複数の携帯電話機それぞれに割り当てられた１以上のチャンネルの音声データを再生させる再生指示手段（Ｓ０９，Ｓ１０）と、を備える。
【選択図】　図３



【特許請求の範囲】
【請求項1】
複数の再生装置からなる再生システムであって、
前記複数の再生装置それぞれは、複数チャンネルの音声データを再生するための再生手段と、
現在位置を検出する位置検出手段と、
前記複数の再生装置のうち他の再生装置と通信するための通信手段と、を備え、
前記複数の再生装置のうち少なくとも１つの再生装置は、前記複数の再生装置それぞれの位置を取得する位置取得手段と、
前記複数の再生装置それぞれの位置に基づいて、前記複数の再生装置それぞれに前記複数チャンネルのうちの１以上のチャンネルを割り当てる割当手段と、
前記複数の再生装置それぞれに前記割り当てられた前記１以上のチャンネルの音声データを再生させる再生指示手段と、を備えた再生システム。
【請求項2】
前記少なくとも１つの再生装置は、前記複数の再生装置の位置に基づいて、前記複数の再生装置それぞれに割り当てられた１以上のチャンネルの音声データそれぞれを再生する音量を決定する音量決定手段をさらに備え、
前記再生指示手段は、前記複数の再生装置それぞれに割り当てられた前記１以上のチャンネルを前記決定された音量で再生させる、請求項１に記載の再生システム。
【請求項3】
前記複数の再生装置の１つの親装置は、前記位置取得手段と、前記割当手段と、前記再生指示手段とを備え、
前記再生指示手段は、前記複数の再生装置のうち前記親装置以外の１以上の子装置それぞれに、該子装置に割り当てられた前記１以上のチャンネルを再生させるための再生指示を送信する再生指示送信手段を含み、
前記１以上の子装置それぞれの前記再生手段は、前記親装置から受信される前記再生指示に従って、前記複数チャンネルの音声データのうち前記１以上のチャンネルの音声データを再生する、請求項１に記載の再生システム。
【請求項4】
前記複数の再生装置の１つの親装置は、前記位置取得手段と、前記割当手段と、前記再生指示手段とを備え、
前記親装置は、さらに、参加要求を送信する参加要求送信手段と、
前記参加要求の送信に応じて参加することを示す１以上の参加応答を受信することを条件に、前記受信された１以上の参加応答をそれぞれ送信してきた１以上の再生装置を前記１以上の子装置として含む前記複数の再生装置を決定するシステム構成手段と、を備え、
前記複数の再生装置のうち前記親装置以外の１以上の子装置それぞれは、さらに、
前記親装置から参加要求を受信することに応じて、前記参加応答を送信するか否かをユーザに問合せる問合手段と、
前記参加応答を送信するか否かを示すユーザによる操作を受け付ける操作受付手段と、
前記操作受付手段により前記参加応答を送信することを示す操作が受け付けられることを条件に、前記位置検出手段により検出された現在位置を示す位置情報を含む前記参加応答を前記親装置に送信する参加応答送信手段と、を備える請求項１に記載の再生システム。
【請求項5】
複数チャンネルの音声データを再生可能な複数の再生装置それぞれの位置を取得する位置取得手段と、
前記複数の再生装置それぞれの位置に基づいて、前記複数の再生装置それぞれに前記複数チャンネルのうちの１以上のチャンネルを割り当てる割当手段と、
前記複数の再生装置それぞれに前記割り当てられた前記１以上のチャンネルを再生させ

る再生指示手段と、を備えた再生制御装置。
【請求項6】
複数チャンネルの音声データを再生可能な複数の再生装置それぞれの位置を取得するステップと、
前記複数の再生装置それぞれの位置に基づいて、前記複数の再生装置それぞれに前記複数チャンネルのうちの１以上のチャンネルを割り当てるステップと、
前記複数の再生装置それぞれに前記割り当てられた前記１以上のチャンネルを再生させるステップと、を含む再生制御方法。
【請求項7】
複数チャンネルの音声データを再生可能な複数の再生装置それぞれの位置を取得するステップと、
前記複数の再生装置それぞれの位置に基づいて、前記複数の再生装置それぞれに前記複数チャンネルのうちの１以上のチャンネルを割り当てるステップと、
前記複数の再生装置それぞれに前記割り当てられた前記１以上のチャンネルを再生させるステップと、をコンピュータに実行させる再生制御プログラム。
【発明の詳細な説明】
【技術分野】
【0001】
この発明は、再生システム、再生制御装置、再生制御方法および再生制御プログラムに関し、特にマルチチャンネルの音声を再生するための再生システム、再生制御装置、その再生制御装置により実行される再生制御方法および再生制御プログラムに関する。
【背景技術】
【0002】
近年、５．１チャンネル等のマルチチャンネルのデジタル音声が放送される場合がある。この５．１チャンネルのデジタル音声を再生するサラウンドシステムが、特開２００７－４３３２０号公報（特許文献１）に記載されている。従来のサラウンドシステムは、オーディオ信号再生装置より出力された各チャンネルのオーディオ信号を配置されたスピーカから各々再生することによりサラウンド音場を形成するサラウンドシステムであり、リスニングポイントから各スピーカまでの距離を測定し、その距離データをオーディオ信号再生装置に伝送するカメラのオートフォーカス機能とＵＳＢ接続を利用した測距装置と、伝送された距離データを取得し比較することにより、各チャンネルのオーディオ信号の音量調整データとディレイ時間設定データとを生成し、この音量調整データとディレイ時間設定データに応じてオーディオ信号に対する音量とディレイ時間を制御するオーディオ信号再生装置と、を備える。このように、５．１チャンネルのデジタル音声を臨場感のある音で再生するためには、異なる位置に配置された６つのスピーカが必要となる。
【0003】
一方、携帯電話機は、５．１チャンネルのデジタル音声放送を受信可能であるが、音声を再生するためのスピーカを多くても２つしか備えていない。このため、最大で２チャンネルの音声しか出力できず、臨場感のある音を再生することができないといった問題がある。
【特許文献1】特開２００７－４３３２０号公報
【発明の開示】
【発明が解決しようとする課題】
【0004】
この発明は上述した問題点を解決するためになされたもので、この発明の目的の一つは、臨場感のある音を再生することが可能な再生システムを提供することである。
【0005】
この発明の他の目的は、臨場感のある音を再生することが可能な再生制御装置を提供することである。
【0006】
この発明のさらに他の目的は、臨場感のある音を再生することが可能な再生制御方法を

提供することである。
【0007】
この発明のさらに他の目的は、臨場感のある音を再生することが可能な再生制御プログラムを提供することである。
【課題を解決するための手段】
【0008】
この発明は上述した目的を達成するためになされたもので、この発明のある局面によれば、再生システムは、複数の再生装置からなる再生システムであって、複数の再生装置それぞれは、複数チャンネルの音声データを再生するための再生手段と、現在位置を検出する位置検出手段と、複数の再生装置のうち他の再生装置と通信するための通信手段と、を備え、複数の再生装置のうち少なくとも１つの再生装置は、複数の再生装置それぞれの位置を取得する位置取得手段と、複数の再生装置それぞれの位置に基づいて、複数の再生装置それぞれに複数チャンネルのうちの１以上のチャンネルを割り当てる割当手段と、複数の再生装置それぞれに割り当てられた１以上のチャンネルの音声データを再生させる再生指示手段と、を備える。
【0009】
この局面に従えば、複数の再生装置のうち少なくとも１つの再生装置において、複数の再生装置それぞれの位置が取得され、複数の再生装置それぞれの位置に基づいて、複数の再生装置それぞれに複数チャンネルのうちの１以上のチャンネルが割り当てられ、複数の再生装置それぞれにおいて割り当てられた１以上のチャンネルの音声データが再生される。このため、複数の再生装置が一度に複数のチャンネルを再生することができない場合であっても、複数の再生装置で異なるチャンネルを分担して再生するので、複数のチャンネルを複数の再生装置で再生することができる。その結果、臨場感のある音を再生することが可能な再生システムを提供することができる。
【0010】
好ましくは、少なくとも１つの再生装置は、複数の再生装置の位置に基づいて、複数の再生装置それぞれに割り当てられた１以上のチャンネルの音声データそれぞれを再生する音量を決定する音量決定手段をさらに備え、再生指示手段は、複数の再生装置それぞれに割り当てられた１以上のチャンネルを決定された音量で再生させる。
【0011】
この局面に従えば、複数の再生装置の位置に基づいて、複数の再生装置それぞれに割り当てられた１以上のチャンネルの音声データそれぞれを再生する音量が決定され、決定された音量でチャンネルの音声データが再生される。このため、複数のチャンネルの音をバランスよく再生することができる。
【0012】
好ましくは、複数の再生装置の１つの親装置は、位置取得手段と、割当手段と、再生指示手段とを備え、再生指示手段は、複数の再生装置のうち親装置以外の１以上の子装置それぞれに、該子装置に割り当てられた１以上のチャンネルを再生させるための再生指示を送信する再生指示送信手段を含み、１以上の子装置それぞれの再生手段は、親装置から受信される再生指示に従って、複数チャンネルの音声データのうち１以上のチャンネルの音声データを再生する。
【0013】
好ましくは、複数の再生装置の１つの親装置は、位置取得手段と、割当手段と、再生指示手段とを備え、親装置は、さらに、参加要求を送信する参加要求送信手段と、参加要求の送信に応じて参加することを示す１以上の参加応答を受信することを条件に、受信された１以上の参加応答をそれぞれ送信してきた１以上の再生装置を１以上の子装置として含む複数の再生装置を決定するシステム構成手段と、を備え、複数の再生装置のうち親装置以外の１以上の子装置それぞれは、さらに、親装置から参加要求を受信することに応じて、参加応答を送信するか否かをユーザに問合せる問合手段と、参加応答を送信するか否かを示すユーザによる操作を受け付ける操作受付手段と、操作受付手段により参加応答を送

信することを示す操作が受け付けられることを条件に、位置検出手段により検出された現在位置を示す位置情報を含む参加応答を親装置に送信する参加応答送信手段と、を備える。

【0014】

この局面に従えば、１以上の子装置それぞれは、親装置から参加要求を受信することに応じて、参加応答を送信するか否かをユーザに問合せ、参加応答を送信することを示す操作がユーザにより指示され、受け付けられることを条件に、参加応答を親装置に返信する。このため、ユーザにより音声データを再生するか否かが決定される。その結果、ユーザの意に反して音声が再生されるのを防止することができる。

【0015】

この発明の他の局面に従えば、再生制御装置は、複数チャンネルの音声データを再生可能な複数の再生装置それぞれの位置を取得する位置取得手段と、複数の再生装置それぞれの位置に基づいて、複数の再生装置それぞれに複数チャンネルのうちの１以上のチャンネルを割り当てる割当手段と、複数の再生装置それぞれに割り当てられた１以上のチャンネルの音声データを再生させる再生指示手段と、を備える。

【0016】

この局面に従えば、複数の再生装置に異なるチャンネルを分担して再生させるので、複数のチャンネルを複数の再生装置で再生させることできる。その結果、臨場感のある音を再生することが可能な再生制御装置を提供することができる。

【0017】

この発明のさらに他の局面に従えば、再生制御方法は、複数チャンネルの音声データを再生可能な複数の再生装置それぞれの位置を取得するステップと、複数の再生装置それぞれの位置に基づいて、複数の再生装置それぞれに複数チャンネルのうちの１以上のチャンネルを割り当てるステップと、複数の再生装置それぞれに割り当てられた１以上のチャンネルを再生させるステップと、を含む。

【0018】

この局面に従えば、臨場感のある音を再生することが可能な再生制御方法を提供することができる。

【0019】

この発明のさらに他の局面によれば、再生制御プログラムは、複数チャンネルの音声データを再生可能な複数の再生装置それぞれの位置を取得するステップと、複数の再生装置それぞれの位置に基づいて、複数の再生装置それぞれに複数チャンネルのうちの１以上のチャンネルを割り当てるステップと、複数の再生装置それぞれに割り当てられた１以上のチャンネルを再生させるステップと、をコンピュータに実行させる。

【0020】

この局面に従えば、臨場感のある音を再生することが可能な再生制御プログラムを提供することができる。

【発明を実施するための最良の形態】

【0021】

以下、本発明の実施の形態について図面を参照して説明する。以下の説明では同一の部品には同一の符号を付してある。それらの名称および機能も同じである。したがってそれらについての詳細な説明は繰返さない。

【0022】

図１は、本発明の実施の形態の１つにおける再生システムの全体概要を示す図である。図１を参照して、再生システム１００は、再生装置として５台の携帯電話機１，１Ａ，１Ｂ，１Ｃ，１Ｄを含む。携帯電話機１，１Ａ，１Ｂ，１Ｃ，１Ｄそれぞれは、マルチチャンネルのラジオ放送を受信し、マルチチャンネルの少なくとも１つのチャンネルを選択して再生することが可能である。さらに、携帯電話機１，１Ａ，１Ｂ，１Ｃ，１Ｄそれぞれは、他の携帯電話機と通信することが可能である。携帯電話機１，１Ａ，１Ｂ，１Ｃ，１Ｄの機能および構成は、同一なのでここでは、特に言及しない限り携帯電話機１を例に説

明する。

【0023】

図２は、携帯電話機の機能の一例を示す機能ブロック図である。図２を参照して、携帯電話機１は、携帯電話機１の全体を制御するための制御部２１と、アンテナ２２Ａと接続された無線回路２２と、アンテナ２３Ａと接続された無線ＬＡＮ回路２３と、音声データを処理するためのコーデック部２８と、それぞれがコーデック部２８に接続されたマイクロフォン１３および第１スピーカ１１と、アンテナ２４Ａに接続されたチューナ２４と、ＡＶデコーダ２９と、ユーザの操作の入力を受付ける操作部２５と、ＧＰＳセンサ２６と、カードインターフェース（Ｉ／Ｆ）２７と、液晶表示装置（ＬＣＤ）１６の表示を制御するための表示制御部３０と、制御部２１で実行するプログラム等を記憶するためのＲＯＭ（Ｒｅａｄ　Ｏｎｌｙ　Ｍｅｍｏｒｙ）３１と、制御部２１の作業領域として使用されるＲＡＭ（Ｒａｎｄｏｍ　Ａｃｃｅｓｓ　Ｍｅｍｏｒｙ）３２と、データを不揮発的に記憶するＥＥＰＲＯＭ（Ｅｌｅｃｔｒｏｎｉｃａｌｌｙ　Ｅｒａｓａｂｌｅ　ａｎｄ　Ｐｒｏｇｒａｍｍａｂｌｅ　ＲＯＭ）３３と、を含む。

【0024】

無線回路２２は、Ｗ－ＣＤＭＡ（Ｗｉｄｅｂａｎｄ　Ｃｏｄｅ　Ｄｉｖｉｓｉｏｎ　Ｍｕｌｔｉｐｌｅ　Ａｃｃｅｓｓ）の通信方式のネットワークに接続する。具体的には、無線回路２２は、Ｗ－ＣＤＭＡのネットワークに接続された基地局装置と無線通信する。基地局装置が送信する無線信号は、アンテナ２２Ａにより受信される。無線回路２２は、アンテナ２２Ａにより受信された無線信号が入力され、無線信号を復調した信号を制御部２１に出力する。無線信号を復調した信号が音声信号の場合、制御部２１は、音声信号をコーデック部２８に出力する。

【0025】

無線回路２２は、制御部２１から信号が入力されると、その信号を変調した無線信号をアンテナ２２Ａに出力する。制御部２１は、コーデック部２８から音声信号が入力されると、音声信号を第１の無線回路２２に出力する。アンテナ２２Ａから送信される無線信号は、Ｗ－ＣＤＭＡの基地局装置で受信され、Ｗ－ＣＤＭＡの基地局装置に入力される。

【0026】

なお、ここでは無線回路２２がＷ－ＣＤＭＡのネットワークに接続する例を示すが、ＰＤＣ（Ｐｅｒｓｏｎａｌ　Ｄｉｇｉｔａｌ　Ｃｅｌｌｕｌａｒ）方式、ＧＳＭ（Ｇｌｏｂａｌ　Ｓｙｓｔｅｍ　ｆｏｒ　Ｍｏｂｉｌｅ）方式、ＣＤＭＡ（Ｃｏｄｅ　Ｄｉｖｉｓｉｏｎ　Ｍｕｌｔｉｐｌｅ　Ａｃｃｅｓｓ）方式のネットワーク、ＰＨＳ（Ｐｅｒｓｏｎａｌ　Ｈａｎｄｙｐｈｏｎｅ　Ｓｙｓｔｅｍ）のネットワークであってもよい。

【0027】

無線ＬＡＮ回路２３は、通信手段の一例であり、ＷｉＭＡＸ（Ｗｏｒｌｄｗｉｄｅ　Ｉｎｔｅｒｏｐｅｒａｂｉｌｉｔｙ　ｆｏｒ　Ｍｉｃｒｏｗａｖｅ　Ａｃｃｅｓｓ）の通信方式のネットワークに接続する。ＷｉＭＡＸの通信方式は、Ｗｉｒｅｌｅｓｓ　ＭＡＮ（Ｗｉｒｅｌｅｓｓ　Ｍｅｔｒｏｐｏｌｉｔａｎ　Ａｒｅａ　Ｎｅｔｗｏｒｋ）とも呼ばれ、ＩＥＥＥ８０２．１６という都市規模のエリアを対象として高速無線通信を提供する規格である。無線ＬＡＮ回路２３は、具体的には、ＷｉＭＡＸのネットワークに接続された別の携帯電話機１Ａ，１Ｂ，１Ｃ，１Ｄまたはアクセスポイントと無線通信する。携帯電話機１Ａ，１Ｂ，１Ｃ，１Ｄまたはアクセスポイントが送信する無線信号は、アンテナ２３Ａにより受信される。無線ＬＡＮ回路２３は、アンテナ２３Ａにより受信された無線信号が入力され、無線信号を復調した信号を制御部２１に出力する。

【0028】

無線ＬＡＮ回路２３は、制御部２１から送信の信号が入力されると、その信号を変調した無線信号をアンテナ２３Ａに出力する。アンテナ２３Ａから送信される無線信号は、携帯電話機１Ａ，１Ｂ，１Ｃ，１Ｄまたはアクセスポイントで受信される。

【0029】

なお、ここでは無線ＬＡＮ回路２３がＷｉＭＡＸのネットワークに接続する例を示すが、無線ＬＡＮであれば、ＷｉＭＡＸのネットワークに限定されるものではなく、例えば、ＢＬＵＥＴＯＯＴＨ（登録商標）、ＷｉＦｉ（登録商標）等のネットワークであってもよい。

【0030】

コーデック部２８は、制御部２１から入力される音声信号を復号し、復号したデジタルの音声信号をアナログに変換し、増幅し、そしてレシーバとしての第１スピーカ１１に出力する。また、コーデック部２８は、マイクロフォン１３からアナログの音声信号が入力され、音声信号をデジタルに変換し、符号化し、そして符号化した音声信号を制御部２１に出力する。

【0031】

チューナ２４は、アンテナ２４Ａに接続されており、アンテナ２４Ａにより受信されたデジタル音声の放送信号が入力される。放送信号は、高周波デジタル変調信号であり、ラジオ放送の場合は音声データを含み、テレビ放送の場合は映像データおよび音声データを含む。チューナ２４は、アンテナ２４Ａから入力される高周波デジタル変調信号から特定の周波数の信号を取り出す。また、チューナ２４は、逆インターリーブ回路、誤り訂正回路を備えており、取り出した特定の周波数の高周波デジタル変調信号を復調して可変長符号をＡＶデコーダ２９に出力する。

【0032】

ＡＶデコーダ２９は、再生手段の一例であり、ビデオデコーダおよびオーディオデコーダを備えており、チューナ２４から入力された可変長符号を復号して映像信号および音声信号を生成し、映像信号をＤ／Ａ（デジタル／アナログ）変換して表示制御部３０に出力し、音声信号をＤ／Ａ変換して第２スピーカ１２に与える。以下の説明では、５．１チャンネルの音声信号を含むデジタル音声放送の放送電波を受信して再生する例を示す。なお、ここではデジタルの音声信号を受信する例を示すが、アナログの音声信号を受信して再生するようにしてもよい。

【0033】

また、ＡＶデコーダ２９は、音声信号が５．１チャンネルの場合、制御部２１により制御され、５．１チャンネルのうちから１つを選択し、選択されたチャンネルの音声信号をＤ／Ａ変換し、増幅し、第２スピーカ１２に与える。携帯電話機１が第２スピーカ１２を２つ備える場合、ＡＶデコーダ２９は、５．１チャンネルのうちから２つを選択し、選択された２つのチャンネルの音声信号をＤ／Ａ変換し、増幅し、２つの第２スピーカ１２にそれぞれ与える。

【0034】

表示制御部３０は、制御部２１により制御され、制御部２１から入力される指示に従ってＬＣＤ１６を制御して、ＬＣＤ１６に画像を表示させる。ＬＣＤ１６に表示させる画像は、動画像と静止画像とを含む。

【0035】

カードＩ／Ｆ２７には、着脱可能なフラッシュメモリ２７Ａが装着される。制御部２１は、カードＩ／Ｆ２７を介して、フラッシュメモリ２７Ａにアクセスが可能である。なお、ここでは制御部２１で実行するためのプログラムをＲＯＭ３１に記憶しておく例を説明するが、プログラムをフラッシュメモリ２７Ａに記憶しておき、フラッシュメモリ２７Ａからプログラムを読み出して、制御部２１で実行するようにしてもよい。プログラムを記憶する記録媒体としては、フラッシュメモリ２７Ａに限られず、フレキシブルディスク、カセットテープ、光ディスク（ＣＤ－ＲＯＭ（Ｃｏｍｐａｃｔ　Ｄｉｓｃ－ＲＯＭ）／ＭＯ（Ｍａｇｎｅｔｉｃ　Ｏｐｔｉｃａｌ　Ｄｉｓｃ）／ＭＤ（Ｍｉｎｉ　Ｄｉｓｃ）／ＤＶＤ（Ｄｉｇｉｔａｌ　Ｖｅｒｓａｔｉｌｅ　Ｄｉｓｃ））、ＩＣカード（メモリカードを含む）、光カード、マスクＲＯＭ、ＥＰＲＯＭ、ＥＥＰＲＯＭなどの半導体メモリ等でもよい。また、携帯電話機１をインターネットに無線回路２２または無線ＬＡＮ回路２３を介して接続し、インターネットに接続されたコンピュータからプログラムをダウンロー

ドして、制御部２１で実行するようにしてもよい。ここでいうプログラムは、制御部２１により直接実行可能なプログラムだけでなく、ソースプログラム形式のプログラム、圧縮処理されたプログラム、暗号化されたプログラム等を含む。

【0036】

ＧＰＳセンサ２６は、位置検出手段の一例であり、全地球測位システム（ＧＰＳ）におけるＧＰＳ衛星からの電波を受信し、現在の地図上の位置を計測する。ＧＰＳセンサ２６は、計測して得た地図上の位置を示す位置情報を制御部２１に出力する。

【0037】

操作部２５は、操作キー１４と、ランプ２５Ａとを含む。操作キー１４は、ユーザによる操作の入力を受け付け、受付けた操作を制御部２１に出力する。ランプ２５Ａは、制御部２１により制御されて発光する。これにより、ユーザは、暗い場所でも操作キー１４を確認することができる。

【0038】

制御部２１は、操作キー１４から操作が入力されると、入力された操作に応じて処理を実行する。制御部２１は、ＲＯＭ３１に記憶されている複数のアプリケーションプログラムを読出して実行する。アプリケーションプログラムには、後述する再生プログラム、携帯電話機１をラジオとして機能させるためのアプリケーションプログラムを含む。これらのアプリケーションプログラムは、Ｃ言語やＪＡＶＡ（登録商標）などのプログラム言語で記述されるが、アプリケーションプログラムが記述されるプログラム言語は、これらに限定されることなく、他のいかなるプログラム言語で記述されてもよい。また、複数のアプリケーションプログラムがＲＯＭ３１に記憶されて携帯電話機１に搭載されるが、複数のアプリケーションプログラムは、単一のプログラム言語で記述されたものであってもよいし、異なるプログラム言語で記述されたものであってもよい。すなわち、複数のプログラム言語で記述されたアプリケーションプログラムが混在してもよい。

【0039】

制御部２１は、複数のアプリケーションプログラムを同時に実行することが可能である。ここでは、携帯電話機１をラジオとして機能させるためのアプリケーションプログラムと、複数の携帯電話機で分担してラジオ放送を再生させるためのアプリケーションプログラム（以下、「再生プログラム」という）と、を同時に実行する場合を例に説明する。

【0040】

本実施の形態における再生システム１００においては、ラジオ放送のマルチチャンネルの少なくとも１つを携帯電話機１，１Ａ，１Ｂ，１Ｃ，１Ｄそれぞれに割り当て、携帯電話機１，１Ａ，１Ｂ，１Ｃ，１Ｄの全体でマルチチャンネルのラジオ放送を再生する。このために携帯電話機１，１Ａ，１Ｂ，１Ｃ，１Ｄのいずれか１つが親機（親装置）に設定され、他の携帯電話機が子機（子装置）に設定される。ここでは、携帯電話機１が親機に設定され、他の携帯電話機１Ａ，１Ｂ，１Ｃ，１Ｄが子機に設定される場合を例に説明する。親機に設定された携帯電話機１は、子機に設定された携帯電話機１Ａ，１Ｂ，１Ｃ，１Ｄそれぞれからそれらの地図上の位置を示す位置情報を取得し、取得した子機の位置情報と親機である携帯電話機１の位置情報とから携帯電話機１，１Ａ，１Ｂ，１Ｃ，１Ｄの位置関係を示す配置マップを生成する。携帯電話機１は、生成した配置マップに基づいて、携帯電話機１，１Ａ，１Ｂ，１Ｃ，１Ｄそれぞれに５．１チャンネルのいずれを割り当てるか決定し、携帯電話機１，１Ａ，１Ｂ，１Ｃ，１Ｄそれぞれに割り当てられたチャンネルの音を再生させる。

【0041】

図３は、チャンネル割当処理の流れの一例を示すフローチャートである。チャンネル割当処理は、親機である携帯電話機１の制御部２１が再生プログラムおよび携帯電話機１をラジオとして機能させるためのアプリケーションプログラムを実行することにより制御部２１により実行される処理である。

【0042】

図３を参照して、制御部２１は、サウンドグループ再生指示を受け付けたか否かを判断

する（ステップＳ０１）。ユーザが、操作部２５が有する操作キー１４のうちサウンドグループ再生指示を指示するために予め割り当てられたキーを指示すれば、サウンドグループ再生指示を受け付ける。そして、無線ＬＡＮ回路２３を介してブロードキャストで参加要求を送信する（ステップＳ０２）。制御部２１がステップＳ０２を実行することにより、参加要求送信手段が構成される。参加要求は、複数の携帯電話機でマルチチャンネルの音声を、チャンネルを分担して再生するサウンドグループへの参加を要求するための信号である。無線ＬＡＮ回路２３が送信する電波の伝播距離が限られていれば、携帯電話機から伝播距離の範囲内に位置する携帯電話機１Ａ，１Ｂ，１Ｃ，１Ｄが参加要求を受信する。ここでは、携帯電話機１Ａ，１Ｂ，１Ｃ，１Ｄが参加要求を受信した場合を例に説明する。

【0043】

そして、所定時間内に参加要求を受信した携帯電話機１Ａ，１Ｂ，１Ｃ，１Ｄから参加応答を受信したか否かを判断する（ステップＳ０３）。参加応答は、参加要求に対する応答であり、マルチチャンネルの音声を再生するサウンドグループに参加することを示す信号である。また、参加応答は、その参加応答を送信してきた携帯電話機の現在の地図上の位置を示す位置情報を含む。さらに、参加応答は、参加応答を送信してきた携帯電話機の装置情報を含む。装置情報は、スピーカ数、スピーカの性能情報（ｄｂ）、スピーカがステレオかモノラルかを示すスピーカ構成、指向性調整可否等の情報を含む。

【0044】

ステップＳ０３においては、所定時間が経過するまで参加要求の受信を継続し、所定時間内に１以上の参加要求を受信したならば処理をステップＳ０４に進め、所定時間内に参加要求を１つも受信しない場合には、処理をステップＳ１８に進める。ステップＳ１８においては、マルチチャンネルの音声をサウンドグループで再生できないことを示すエラーメッセージをＬＣＤ１６に表示し、処理を終了する。参加応答が１つもなければ、複数台でサウンドグループを構成することができないからである。

【0045】

ステップＳ０４においては、参加応答を送信してきた装置を子機に設定する。制御部２１がステップＳ０４を実行することにより、サウンドグループを構成する親機と子機とを決定するシステム構成手段が構成される。具体的には、参加応答とともに装置を識別するための装置識別情報を受信するので、その装置識別情報をＥＥＰＲＯＭ３３に記憶する。装置識別情報は、例えば、ＩＰ（Ｉｎｔｅｒｎｅｔ　Ｐｒｏｔｏｃｏｌ）アドレスを用いることができる。ここでは、携帯電話機１Ａ，１Ｂ，１Ｃ，１Ｄのすべてから参加応答を受信した場合を例に説明する。

【0046】

次のステップＳ０５においては、現在の地図上の位置を示す位置情報を取得する。ＧＰＳセンサ２６が出力する位置情報を取得する。ステップＳ０３において参加応答が受信される参加応答は子機の位置情報を含むため、ステップＳ０３において参加応答が受信され、ステップＳ０５において自機の位置情報が取得されると、親機および参加応答を送信してきた子機の位置情報が取得される。したがって、制御部２１がステップＳ０３とステップＳ０５が実行することにより位置取得手段が構成される。次のステップＳ０６においては、子機の位置情報と、親機の位置情報とに基づいて、配置マップを生成する。配置マップは、サウンドグループを構成する携帯電話機１，１Ａ，１Ｂ，１Ｃ，１Ｄの相対的な位置を示す図である。

【0047】

図４は、配置マップの一例を示す図である。図４を参照して、配置マップは、携帯電話機１，１Ａ，１Ｂ，１Ｃ，１Ｄそれぞれの位置を示す印と、各位置を結んだ線分とを含む。

【0048】

図３に戻って、ステップＳ０７においては、生成された配置マップに従って、５．１チャンネルを、子機と自装置とにそれぞれ割り当てる。制御部２１がステップＳ０７を実行

することにより割当手段が構成される。具体的には、図４に示した配置マップを用いて説明すると、まず、携帯電話機１，１Ａ，１Ｂ，１Ｃ，１Ｄの隣接する２つを線で結んだ線分で形成される形状を分析する。形状の長手方向を左右方向、それに直交する方向を前後方向に決定する。また、形状の長手方向の線分のうち最も長い線分側を前方向とする。より具体的には、配置マップにおいて携帯電話機１と携帯電話機１Ａを結ぶ線分と、携帯電話機１と携帯電話機１Ｃとを結ぶ線分と、携帯電話機１Ｂと携帯電話機１Ｄとを結ぶ線分とを左右方向の線分と判断し、携帯電話機１Ａと携帯電話機１Ｂとを結ぶ線分と、携帯電話機１Ｃと携帯電話機１Ｄとを結ぶ線分とを前後方向の線分と判断する。さらに、長手方向の３本の線分のうち最も長い携帯電話機１Ｂと携帯電話機１Ｄとを結ぶ線分を前方向と判断し、他の携帯電話機１と携帯電話機１Ａを結ぶ線分と、携帯電話機１と携帯電話機１Ｃとを結ぶ線分とを後方向と判断する。

【0049】

５．１チャンネルは、視聴者から見て中央の音を示す中央チャンネル、前方かつ左の音を示す前左チャンネル、前方かつ右の音を示す前右チャンネル、後方かつ左の音を示す後左チャンネル、後方かつ右の音を示す後右チャンネル、およびサブウーファーの音を示すサブウーファチャンネルを含む。

【0050】

このため、配置マップで携帯電話機１，１Ａ，１Ｂ，１Ｃ，１Ｄの中央に位置する携帯電話機１に中央チャンネルを割り当て、携帯電話機１Ａに後左チャンネルを割り当て、携帯電話機１Ｂに前左チャンネルを割り当て、携帯電話機１Ｃに後右チャンネルを割り当て、携帯電話機１Ｄに前右チャンネルを割り当てる。図４に示す配置マップにおいては、サブウーファチャンネルは、携帯電話機１，１Ａ，１Ｂ，１Ｃ，１Ｄいずれにも割り当てない。なお、携帯電話機１，１Ａ，１Ｂ，１Ｃ，１Ｄのうちにステレオで再生する機能を有するものがあれば、その携帯電話機が２つのチャンネルを再生するようにすることができる。例えば、携帯電話機１がステレオで再生する機能を有すれば、携帯電話機１に中央チャンネルと、サブウーファチャンネルとが割り当てられる。

【0051】

親機が５．１チャンネルを割り当てる割当パターンは、再生システム１００を構成する携帯電話機の台数、および携帯電話機が有する機能に基づき定まる。

【0052】

図５は、チャンネル割当パターンの一例を示す図である。図５を参照して、第１行目～第５行目は、サウンドグループがモノラルの音声を再生する機能を有する携帯電話機で構成される場合における割当パターンを示している。第１行目は、サウンドグループが６台の携帯電話機で構成される場合における割当パターンを示し、６台の携帯電話機に中央チャンネル、前左チャンネル、前右チャンネル、後左チャンネル、後右チャンネルおよびサブウーファチャンネルがそれぞれ割り当てられる。第２行目は、サウンドグループが５台の携帯電話機で構成される場合における割当パターンを示し、５台の携帯電話機に中央チャンネル、前左チャンネル、前右チャンネル、後左チャンネルおよび後右チャンネルがそれぞれ割り当てられる。

【0053】

第３行目は、サウンドグループが４台の携帯電話機で構成される場合における割当パターンを示し、４台の携帯電話機に前左チャンネル、前右チャンネル、後左チャンネルおよび後右チャンネルがそれぞれ割り当てられる。第４行目は、サウンドグループが３台の携帯電話機で構成される場合における割当パターンを示し、３台の携帯電話機に中央チャンネル、前左チャンネルおよび前右チャンネルがそれぞれ割り当てられる。第５行目は、サウンドグループが２台の携帯電話機で構成される場合における割当パターンを示し、２台の携帯電話機に前左チャンネルおよび前右チャンネルがそれぞれ割り当てられる。

【0054】

第６行目および第７行目は、サウンドグループがステレオの音声を再生する機能を有する携帯電話機で構成される場合における割当パターンを示している。第６行目は、サウン

ドグループが２台の携帯電話機で構成される場合における割当バターンを示し、前左チャンネル、前右チャンネル、後左チャンネルおよび後右チャンネルのうちから選ばれた２つが１つの携帯電話機に割り当てられ、残りの２つが他の携帯電話機に割り当てられる。第７行目は、サウンドグループが３台の携帯電話機で構成される場合における割当バターンを示し、中央チャンネル、前左チャンネル、前右チャンネル、後左チャンネルおよび後右チャンネルのうちから選ばれた２つが１つの携帯電話機に割り当てられ、残りのチャンネルから選ばれた２つが別の携帯電話機に割り当てられ、残りの１チャンネルが残りの携帯電話機に割り当てられる。
る。

【0055】

図３に戻って、ステップＳ０８においては、ステップＳ０７において割り当てられたチャンネルごとにボリュームを決定する。制御部がステップＳ０７を実行することにより音量決定手段が構成される。ボリュームは、配置マップに含まれる携帯電話機１，１Ａ，１Ｂ，１Ｃ，１Ｄそれぞれの位置に基づき決定される。配置マップにおいて、視聴者の位置を前方の中央に設定し、その視聴者の位置で音のバランスが取れるように、各チャンネルの音を再生するボリュームを決定する。この場合、参加応答とともに受信される装置情報に含まれる携帯電話機が備えるスピーカの性能情報に基づいてボリュームを決定する。これにより、携帯電話機１，１Ａ，１Ｂ，１Ｃ，１Ｄ間でスピーカの性能が違うことにより、携帯電話機１，１Ａ，１Ｂ，１Ｃ，１Ｄで再生される音がばらつくのを防止することができ、バランスの取れた音を複数の携帯電話機１，１Ａ，１Ｂ，１Ｃ，１Ｄで再生することができる。なお、音量に加えて遅延時間を設定するようにしてもよい。

【0056】

次のステップＳ０９においては、子機に再生指示を送信する。制御部２１がステップＳ９を実行することにより再生指示手段に含まれる再生指示送信手段が構成される。再生指示は、子機により異なり、ステップＳ０７において子機に割り当てられたチャンネルと、ステップＳ０８においてチャンネルに対応して決定されたボリュームとを含む。具体的には、携帯電話機１Ａに送信する再生指示は、後左チャンネルを所定のボリュームで再生する指示であり、携帯電話機１Ｂに送信する再生指示は、前左チャンネルを所定のボリュームで再生する指示であり、携帯電話機１Ｃに送信する再生指示は、後右チャンネルを所定のボリュームで再生する指示であり、携帯電話機１Ｄに送信する再生指示は、前右チャンネルを所定のボリュームで再生する指示である。

【0057】

そして、自装置に対する再生指示に従ってラジオ放送の音を再生する（ステップＳ１０）。制御部２１がステップＳ１０を実行することにより再生指示手段が構成される。具体的には、ＡＶデコーダ２９に、チューナ２４から入力される５．１チャンネルの音声信号のうちで再生指示に含まれるチャンネルの音声信号をＤ／Ａ変換させ、再生指示に含まれる音量に増幅させる。ここでは、ＡＢデコーダ２９に中央チャンネルを所定のボリュームで再生させる。これにより、携帯電話機１，１Ａ，１Ｂ，１Ｃ，１Ｄによって、中央チャンネル、後左チャンネル、前左チャンネル、後右チャンネル、前右チャンネルの音がそれぞれ所定のボリュームで再生されるので、視聴者は、バランスのとれた５チャンネルの音を視聴することができる。

【0058】

ステップＳ１１にいては、サウンドグループに属する子機のいずれかから終了指示を受信したか否かを判断する。終了指示は、子機により送信され、子機がラジオ放送の音の再生を終了し、サウンドグループを抜けることを示す信号である。無線ＬＡＮ回路２３が子機に設定されている携帯電話機１Ａ，１Ｂ，１Ｃ，１Ｄのいずれかから終了指示を受信すると、処理をステップＳ１２に進め、そうでなければ処理をステップＳ１４に進める。

【0059】

ステップＳ１２においては、子機数Ｎを１減算し、処理をステップＳ１３に進める。ステップＳ１３においては、子機数Ｎが１以上か否かを判断する。子機数が１以上ならば処

理をステップＳ０６に戻し、子機数が０ならば処理をステップＳ１８に進める。サウンドグループに属する装置が複数台なければ、複数台でサウンドグループを構成することができないからである。例えば、携帯電話機１Ａが終了指示を送信した場合、処理はステップＳ０６に戻り、サウンドグループに残された携帯電話機１，１Ｂ，１Ｃ，１Ｄの４台でサウンドグループが構成され、新たなサウンドグループについて、サウンドグループに含まれる携帯電話機１，１Ｂ，１Ｃ，１Ｄそれぞれにチャンネルが割り当てられ（ステップＳ０８）、チャンネルごとのボリュームが決定され（ステップＳ０９）、再生指示に従って携帯電話機１，１Ｂ，１Ｃ，１Ｄそれぞれにおいて各々に割り当てられたチャンネルの音が再生される。このため、サウンドグループを構成する子機のいずれかがチャンネルの音を再生するのを中止した場合であっても、サウンドグループを構成する残りの親機と子機とで、５．１チャンネルのうち２以上のチャンネルの音を再生することができる。

【0060】

ステップＳ１４においては、終了指示を受け付けたか否かを判断する。ユーザが、操作部２５が有する操作キー１４のうち終了を指示するために予め割り当てられたキーを指示すれば、終了指示を受け付ける。また、内蔵バッテリの電圧が低下した場合、内蔵バッテリの電圧を検出する検出センサから終了指示を受け付ける。終了指示を受け付けたならば処理をステップＳ１５に進め、そうでなければ処理をステップＳ１１に戻す。ステップＳ１５においては、サウンドグループに属する子機のうちから１つの親機を決定する。親機は、複数の子機のうちから任意に選択することが可能である。

【0061】

ステップＳ１６においては、ステップＳ１５において親機に決定した装置に親機転換指示と配置マップとを送信し、処理をステップＳ１７に進める。ステップＳ１７においては、ラジオ放送の再生を終了し、処理を終了する。

【0062】

図６は、チャンネル再生処理の流れの一例を示すフローチャートである。チャンネル再生処理は、子機である携帯電話機１Ａ，１Ｂ，１Ｃ，１Ｄそれぞれが備える制御部２１が再生プログラムおよびラジオとして機能させるためのアプリケーションプログラムを実行することにより制御部２１により実行される処理である。ここでは、携帯電話機１Ｂがチャンネル再生処理を実行する場合を例に説明する。

【0063】

図６を参照して、携帯電話機１Ｂの制御部２１は、参加要求を親機である携帯電話機１から受信したか否かを判断する（ステップＳ５１）。無線ＬＡＮ回路２３が携帯電話機１から参加要求を受信するまで待機状態となり（ステップＳ５１でＮＯ）、参加要求を受信したならば、処理をステップＳ５２に進める。すなわち、チャンネル再生処理は、親機から参加要求を受信することを条件に実行される処理である。なお、親機から参加要求を受信することをトリガーとして再生プログラムを実行するようにしてもよい。

【0064】

ステップＳ５２においては、問合せ画面をＬＣＤ１６に表示し、ユーザにより指示が入力されるまで待機する。制御部２１がステップＳ５２を実行することにより問合手段が構成される。問合せ画面は、ユーザにラジオ放送を再生するサウンドグループに参加するか否かを問合せるための画面であり、例えば、サウンドグループへの参加を要請するためのメッセージとして「この端末でマルチチャンネル音声出力を開始してもよいですか？」を含む。

【0065】

ステップＳ５３においては、参加指示を受け付けたか否かを判断する。制御部２１がステップＳ５３を実行することにより操作受付手段が構成される。ユーザが、操作部２５が有する操作キー１４のうち参加を指示するために予め割り当てられたキーを指示すれば、参加指示を受け付ける。参加指示を受け付けたならば処理をステップＳ５４に進めるが、そうでなければ処理を終了する。

【0066】

ステップＳ５４においては、現在の地図上の位置を示す位置情報を取得する。ＧＰＳセンサ２６が出力する位置情報を取得する。次のステップＳ５５においては、参加要求を送信してきた親機である携帯電話機１に無線ＬＡＮ回路２３を介して参加応答を送信する。制御部２１がステップＳ５５を実行することにより参加応答送信手段が構成される。参加応答は、ステップＳ５４において取得された位置情報と、携帯電話機１Ｂの装置情報とを含む。装置情報は、スピーカ数、スピーカの性能情報（ｄｂ）、スピーカがステレオかモノラルかを示すスピーカ構成、指向性調整可否等の情報を含む。

【0067】

そして、無線ＬＡＮ回路２３が親機である携帯電話機１から再生指示を受信するまで待機状態となり（ステップＳ５６でＮＯ）、再生指示を受信したならば処理をステップＳ５７に進める。次のステップＳ５７においては、受信された再生指示に従って、再生指示に含まれるチャンネルの音声を、再生指示に含まれるボリュームで再生する。具体的には、ＡＶデコーダ２９に、チューナ２４から入力される５．１チャンネルの音声信号のうちで再生指示に含まれるチャンネルの音声信号をＤ／Ａ変換させ、再生指示に含まれる音量に増幅させる。

【0068】

次のステップＳ５８においては、無線ＬＡＮ回路２３が親機である携帯電話機１から親機転換指示を受信したか否かを判断する。親機転換指示を受信したならば処理をステップＳ５９に進めるが、そうでなければ処理をステップＳ６１に進める。ステップＳ５９においては、親機転換指示と共に受信する配置マップに基づき、新たな配置マップを生成する。配置マップに含まれる親機である携帯電話機１を除いた残りの携帯電話機１Ａ，１Ｂ，１Ｃ，１Ｄを含む配置マップを生成する。

【0069】

そして、携帯電話機１Ｂを親機として機能させるために、親機処理を実行する（ステップＳ６０）。親機処理は、図３に示したステップＳ０７～ステップＳ１７に示した処理と同じ処理であり、ここでは説明を繰り返さない。

【0070】

ステップＳ６１においては、終了指示を受け付けたか否かを判断する。ユーザが、操作部２５が有する操作キー１４のうち終了を指示するために予め割り当てられたキーを指示すれば、終了指示を受け付ける。また、内蔵バッテリの電圧が低下した場合、内蔵バッテリの電圧を検出する検出センサから終了指示を受け付ける。終了指示を受け付けたならば処理をステップＳ６２に進めるが、そうでなければ処理をステップＳ５８に戻す。ステップＳ６２においては、親機に終了指示を送信する。そして、ラジオ放送の再生を終了し（ステップＳ６３）、処理を終了する。

【0071】

以上説明したように、本実施の形態における再生システム１００は、再生装置として携帯電話機１，１Ａ，１Ｂ，１Ｃ，１Ｄを含む。携帯電話機１，１Ａ，１Ｂ，１Ｃ，１Ｄのうち親端末である携帯電話機１において、携帯電話機１，１Ａ，１Ｂ，１Ｃ，１Ｄそれぞれの位置を示す位置情報が取得され、配置マップが生成される。そして、配置マップに基づいて、携帯電話機１，１Ａ，１Ｂ，１Ｃ，１Ｄそれぞれに５．１チャンネルのうちの１以上のチャンネルが割り当てられ、携帯電話機１，１Ａ，１Ｂ，１Ｃ，１Ｄそれぞれにおいて割り当てられた１以上のチャンネルの音声データが再生される。このため、携帯電話機１，１Ａ，１Ｂ，１Ｃ，１Ｄが一度に複数のチャンネルを再生することができない場合であっても、携帯電話機１，１Ａ，１Ｂ，１Ｃ，１Ｄで異なるチャンネルを分担して再生するので、５．１チャンネルの音を臨場感ある音で携帯電話機１，１Ａ，１Ｂ，１Ｃ，１Ｄで再生することができる。

【0072】

また、配置マップに基づいて、携帯電話機１，１Ａ，１Ｂ，１Ｃ，１Ｄそれぞれに割り当てられた１以上のチャンネルの音声データそれぞれを再生する音量が決定され、決定された音量でチャンネルの音声データが再生されるので、５．１チャンネルの音をバランス

よく再生することができる。

【0073】

また、子端末である携帯電話機１Ａ，１Ｂ，１Ｃ，１Ｄそれぞれは、親端末である携帯電話機１から参加要求を受信することに応じて、参加応答を送信するか否かをユーザに問合せ、参加応答を送信することを示す操作がユーザにより指示されることを条件に、参加応答を親端末である携帯電話機１に返信する。このため、ユーザによりサウンドグループに参加して音声データを再生するか否かが決定されるので、携帯電話機１Ａ，１Ｂ，１Ｃ，１Ｄそれぞれにおいてユーザの意に反して音声が再生されるのを防止することができる。

【0074】

なお、上述した実施の形態においては、再生システム１００について説明したが、図３に示したチャンネル割当処理または図６に示したチャンネル再生処理を実行するための再生制御方法またはその方法をコンピュータに実行させるための再生制御プログラムとして発明を捉えることができるのは言うまでもない。

【0075】

今回開示された実施の形態はすべての点で例示であって制限的なものではないと考えられるべきである。本発明の範囲は上記した説明ではなくて特許請求の範囲によって示され、特許請求の範囲と均等の意味および範囲内でのすべての変更が含まれることが意図される。

【0076】

＜付記＞

（１）　前記複数の再生装置の位置に基づいて、前記複数の再生装置それぞれに割り当てられた１以上のチャンネルの音声データそれぞれを再生する音量を決定する音量決定手段をさらに備え、

前記再生指示手段は、前記複数の再生装置それぞれに割り当てられた前記１以上のチャンネルを前記決定された音量で再生させる、請求項５に記載の再生制御装置。

（２）　前記再生指示手段は、前記複数の再生装置のうち自装置以外の１以上の他の再生装置それぞれに、該他の再生装置に割り当てられた前記１以上のチャンネルを再生させるための再生指示を送信する再生指示送信手段を含む、請求項５に記載の再生制御装置。

（３）　参加要求を送信する参加要求送信手段と、

前記参加要求の送信に応じて参加することを示す１以上の参加応答を受信することを条件に、前記受信された１以上の参加応答をそれぞれ送信してきた１以上の他の再生装置を含む前記複数の再生装置を決定するシステム構成手段を、さらに備えた請求項５に記載の再生制御装置。

【図面の簡単な説明】

【0077】

【図1】本発明の実施の形態の１つにおける再生システムの全体概要を示す図である。

【図2】携帯電話機の機能の一例を示す機能ブロック図である。

【図3】チャンネル割当処理の流れの一例を示すフローチャートである。

【図4】配置マップの一例を示す図である。

【図5】チャンネル割当パターンの一例を示す図である。

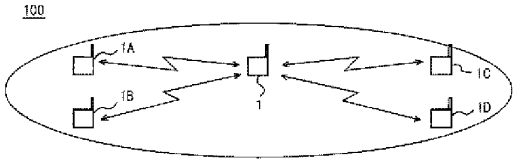
【図6】チャンネル再生処理の流れの一例を示すフローチャートである。

【符号の説明】

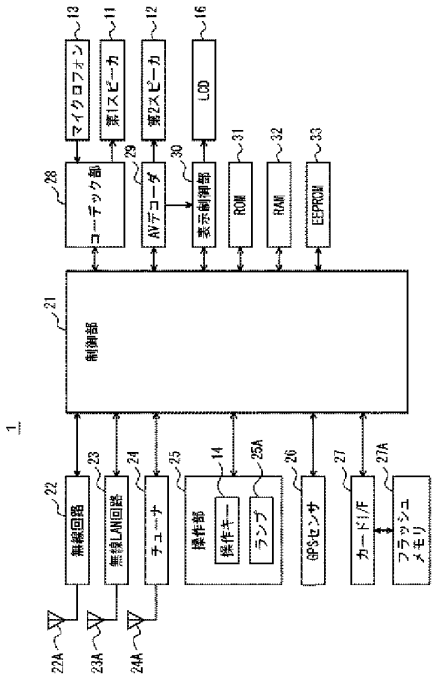
【0078】

１００　再生システム、１，１Ａ，１Ｂ，１Ｃ，１Ｄ　携帯電話機、１１　第１スピーカ、１２　第２スピーカ、１３　マイクロフォン、１４　操作キー、１６　ＬＣＤ１６、２１　制御部、２２　無線回路、２３　無線ＬＡＮ回路、２４　チューナ、２２Ａ，２３Ａ，２４Ａ　アンテナ、２５　操作部、２６　ＧＰＳセンサ、２７　カードＩ／Ｆ、２７Ａ　フラッシュメモリ、２８　コーデック部、２９　ＡＶデコーダ、３０　表示制御部。

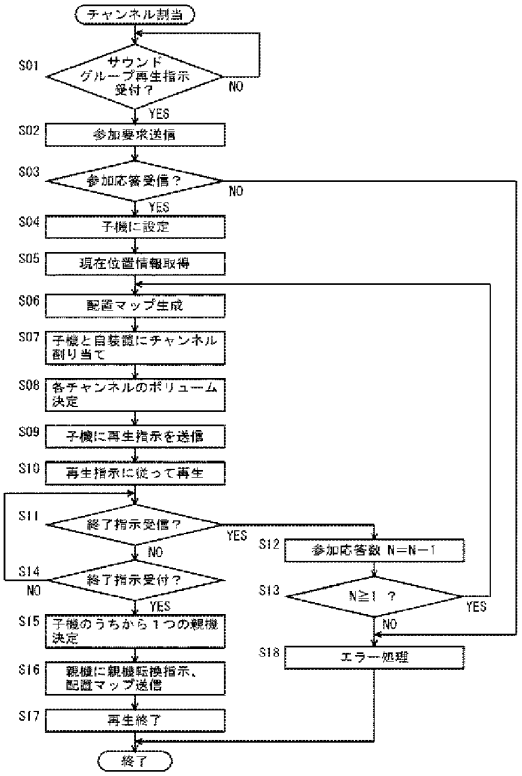
【図1】



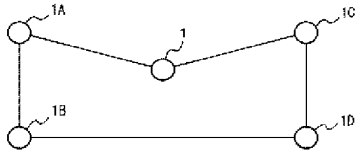

【図2】




【図3】




【図4】

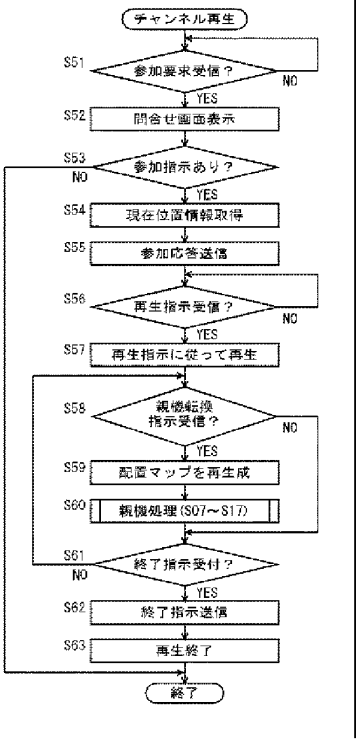



【図5】

割当パターン

| 台数 | 再生能力 | チャンネル | | | | | |
|---|---|---|---|---|---|---|---|
| | | 中央 | 前左 | 前右 | 後左 | 後右 | サブウーファー |
| 6台 | モノラル | ○ | ○ | ○ | ○ | ○ | ○ |
| 5台 | モノラル | ○ | ○ | ○ | ○ | ○ | － |
| 4台 | モノラル | － | ○ | ○ | ○ | ○ | － |
| 3台 | モノラル | ○ | ○ | ○ | － | － | － |
| 2台 | モノラル | － | ○ | ○ | － | － | － |
| 2台 | ステレオ | － | ○ | ○ | ○ | ○ | － |
| 3台 | ステレオ | ○ | ○ | ○ | ○ | ○ | － |

【図6】


チャンネル再生
S51
参加要求受信？
NO
YES
S52
問合せ画面表示
S53
参加指示あり？
NO
YES
S54
現在位置情報取得
S55
参加応答送信
S56
再生指示受信？
NO
YES
S57
再生指示に従って再生
S58
親機転換
指示受信？
NO
YES
S59
配置マップを再生成
S60
親機処理(S07～S17)
S61
終了指示受付？
NO
YES
S62
終了指示送信
S63
再生終了
終了

Espacenet

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## MOBILE WIRELESS COMMUNICATION TERMINALS, SYSTEMS, METHODS, AND COMPUTER PROGRAM PRODUCTS FOR PROVIDING A SONG PLAY LIST

**Inventor(s):**

**Applicant(s):**

**Classification:** - international: ***G10K15/02; G10L19/00; H04M11/00; H04M11/08***
- cooperative: **H04M1/72519**; H04M1/72558

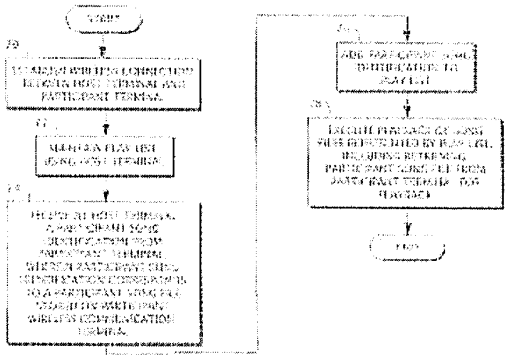
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A mobile wireless communication terminal includes a wireless communication module and a controller. The wireless communication module is configured to communicate with other communication terminals over a wireless interface. The controller is configured to establish a connection with a participant wireless communication terminal via the wireless communication module, to maintain a play list representing song files to be played, to receive a participant song identification from the participant wireless communication terminal, wherein the participant song identification corresponds to a participant song file stored on the participant wireless communication terminal, to add the participant song identification to the play list, and to thereafter execute playback of the song files represented by the play list, including retrieving the participant song file from the participant wireless communication terminal for playback.



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審査請求 有　予備審査請求 有　（全 25 頁）

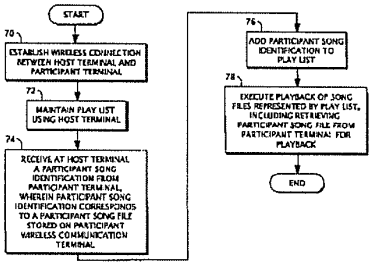
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(54)【発明の名称】楽曲プレイリストを提供する移動無線通信端末、システム、方法およびコンピュータプログラム製品

(57)【要約】
無線通信端末は無線通信モジュール及びコントローラを含む。無線通信モジュールは他の通信端末と無線インタフェースを介して通信するように構成される。コントローラは、無線通信モジュールを介して参加無線通信端末とコネクションを確立し、再生すべき楽曲ファイルを示すプレイリストを保守し、参加無線通信端末に保存されている参加楽曲ファイルと対応する参加楽曲ＩＤを参加無線通信端末から受信し、参加楽曲ＩＤをプレイリストに加え、そしてその後、再生のために参加楽曲ファイルを参加無線通信端末からの読み出すことを含む、プレイリストで示される楽曲ファイルの再生を実行するように構成される。



【特許請求の範囲】
【請求項１】
移動無線通信端末であって、無線インタフェースを通じて他の複数の通信端末と通信するように構成された無線通信モジュールと、
前記無線通信モジュールを介して参加無線通信端末とコネクションを確立し、再生すべき楽曲ファイルを示すプレイリストを保守し、前記参加無線通信端末に保存されている参加楽曲ファイルと対応する参加楽曲ＩＤを前記参加無線通信端末から受信し、前記参加楽曲ＩＤを前記プレイリストに追加し、その後、再生のための前記参加楽曲ファイルの前記参加無線通信端末からの読み出しを含む、前記プレイリストで示される前記楽曲ファイルの再生を実行するように構成されたコントローラとを有することを特徴とする無線通信端末。
【請求項２】
前記コントローラが、前記無線通信モジュールを介して複数の参加無線通信端末とコネクションを確立し、前記複数の参加無線通信端末から、前記複数の参加無線通信端末の各々に保存されている個別の参加楽曲ファイルに対応する参加楽曲ＩＤを複数受信し、前記複数の参加楽曲ＩＤの各々をプレイリストに追加し、前記複数の参加無線通信端末の各々から、再生のために複数の前記参加楽曲ファイルを読み出すように構成されることを特徴とする請求項１記載の無線通信端末。
【請求項３】
前記コントローラが、前記参加無線通信端末からストリーミング音楽ファイルとして前記参加楽曲ファイルを読み出して実行するように構成されることを特徴とする請求項１又は請求項２記載の無線通信端末。
【請求項４】
前記コントローラが、前記参加楽曲ファイルを前記参加無線通信端末から読み出し、前記参加楽曲ファイルを前記無線通信端末に保存し、その後、前記保存した参加楽曲ファイルの再生を実行するように構成されることを特徴とする請求項１又は請求項２記載の無線通信端末。
【請求項５】
前記コントローラが、前記プレイリストで示される前記楽曲ファイルをメディアセンタで再生するために、再生信号を前記メディアセンタに送信するように構成されることを特徴とする請求項１乃至請求項４のいずれか１項に記載の無線通信端末。
【請求項６】
音響変換器をさらに含み、前記コントローラが、前記プレイリストで示される前記楽曲ファイルを前記音響変換器を用いて再生するように構成されることを特徴とする請求項１乃至請求項５のいずれか１項に記載の無線通信端末。
【請求項７】
前記コントローラが、前記プレイリストで示される前記楽曲ファイルを少なくとも１つの参加無線通信端末で再生するため、再生信号を少なくとも１つの参加無線通信端末に送信するように構成されることを特徴とする請求項１乃至請求項６のいずれか１項に記載の無線通信端末。
【請求項８】
前記コントローラが、前記参加無線通信端末に保存されている利用可能な楽曲ファイルを示す楽曲カタログリストを前記参加無線通信端末から受信し、前記利用可能な楽曲ファイルから選択するユーザ入力を受信し、前記選択された入手可能な楽曲ファイルを前記プレイリストに追加するように構成されることを特徴とする請求項１乃至請求項７のいずれか１項に記載の無線通信端末。
【請求項９】
前記コントローラが、前記プレイリストを前記参加無線通信端末で表示するため、前記プレイリストを表すリスト信号を前記参加無線通信端末に送信するように構成されることを特徴とする請求項１乃至請求項８のいずれか１項に記載の無線通信端末。

【請求項１０】
前記コントローラが、ユーザ入力に応じて前記プレイリストを変更するように構成されることを特徴とする請求項１乃至請求項９のいずれか１項に記載の無線通信端末。
【請求項１１】
前記無線通信モジュールが、他の複数の通信端末と直接ポイントツーポイント無線インタフェースを通じて通信するように構成されるとともに、
前記コントローラが、前記無線通信モジュールを介して前記参加無線通信端末との前記コネクションを確立し、前記参加無線通信端末から前記参加楽曲ＩＤを受信し、再生のために、前記参加楽曲ファイルの全てを前記直接ポイントツーポイント無線インタフェースを介して前記参加無線通信端末から読み出すように構成されることを特徴とする請求項１乃至請求項１０のいずれか１項に記載の無線通信端末。
【請求項１２】
前記無線通信モジュールが、短距離送信器を備えるとともに、
前記コントローラが、前記参加無線通信端末と前記コネクションを確立し、前記参加楽曲ＩＤを前記参加無線通信端末から受信し、再生のために、前記参加楽曲ファイルの全てを前記短距離送信器を介して前記参加無線通信端末から読み出すように構成されることを特徴とする請求項１乃至請求項１１のいずれか１項に記載の無線通信端末。
【請求項１３】
前記短距離送信器がブルートゥース送信器であることを特徴とする請求項１２記載の無線通信端末。
【請求項１４】
前記無線通信端末が、携帯電話機を含むことを特徴とする請求項１乃至請求項１３のいずれか１項に記載の無線通信端末。
【請求項１５】
楽曲プレイリストを提供するシステムであって、
ホスト移動無線通信端末と、
参加無線通信端末とを備え、
前記ホスト無線通信端末が、
無線インタフェースを通じて他の複数の通信端末と通信するように構成された無線通信モジュールと、
前記無線通信モジュールを介して前記参加無線通信端末とのコネクションを確立し、再生すべき楽曲ファイルを示すプレイリストを保守し、前記参加無線通信端末に保存されている参加楽曲ファイルと対応する参加楽曲ＩＤを前記参加無線通信端末から受信し、前記参加楽曲ＩＤを前記プレイリストに追加し、その後、再生のための前記参加楽曲ファイルの前記参加無線通信端末からの読み出しを含む、前記プレイリストで示される前記楽曲ファイルの再生を実行するように構成されたコントローラとを含むことを特徴とするシステム。
【請求項１６】
複数の参加無線通信端末を含み、前記コントローラが、前記無線通信モジュールを介して前記複数の参加無線通信端末の各々とコネクションを確立し、前記複数の参加無線通信端末から、前記複数の参加無線通信端末の各々に保存されている個別の参加楽曲ファイルに対応する参加楽曲ＩＤを複数受信し、前記複数の参加楽曲ＩＤの各々を前記プレイリストに追加し、前記複数の参加無線通信端末の各々から、再生のために複数の前記参加楽曲ファイルを読み出すように構成されることを特徴とする請求項１５記載のシステム。
【請求項１７】
ホスト無線通信端末を用いて楽曲プレイリストを提供するための方法であって、
前記ホスト無線通信端末と参加無線通信端末との間で無線コネクションを確立し、
再生すべき楽曲ファイルを示すプレイリストを前記ホスト無線通信端末を用いて保守し、
前記ホスト無線通信端末において、前記参加無線通信端末に保存されている参加楽曲フ

ァイルと対応する参加楽曲ＩＤを前記参加無線通信端末から受信し、
前記参加楽曲ＩＤを前記プレイリストに追加し、その後、
再生のために前記参加楽曲ファイルを前記参加無線通信端末から読み出すことを含む、前記プレイリストによって示される前記楽曲ファイルの再生を実行することを特徴とする方法。
【請求項１８】
ホスト無線通信端末を用いて楽曲プレイリストを提供するためのコンピュータプログラム製品であって、
コンピュータが利用可能なプログラムコードが埋め込まれたコンピュータが利用可能な媒体を含み、前記コンピュータが利用可能なプログラムコードが、
前記ホスト無線通信端末と参加無線通信端末との間で無線コネクションを確立するように構成されたコンピュータ利用可能なプログラムコードと、
再生すべき楽曲ファイルを示すプレイリストを前記ホスト無線通信端末を用いて保守するように構成されたコンピュータ利用可能なプログラムコードと、
前記ホスト無線通信端末において、前記参加無線通信端末に保存されている参加楽曲ファイルと対応する参加楽曲ＩＤを参加無線通信端末から受信するように構成されたコンピュータ利用可能なプログラムコードと、
前記参加楽曲ＩＤを前記プレイリストに追加するように構成されたコンピュータ利用可能なプログラムコードと、
その後、再生のために前記参加楽曲ファイルを前記参加無線通信端末から読み出すことを含み、前記プレイリストによって示される前記楽曲ファイルの再生を実行するように構成されたコンピュータ利用可能なプログラムコードとを含むことを特徴とするコンピュータプログラム製品。
【発明の詳細な説明】
【技術分野】
【０００１】
本発明は電子機器に関し、特には楽曲ファイル(song file)を再生するための電子機器、方法およびコンピュータプログラム製品に関する。
【背景技術】
【０００２】
無線通信端末（例えば携帯電話）のような移動電子機器は、楽曲ファイルの保存・再生に広く用いられている。ユーザは、ある楽曲を、メディアセンター（例えばＰＣやラップトップコンピュータ、テレビ、オーディオレシーバなど）のような他の装置や、他の無線通信端末で再生したいと思うかも知れない。これは、他の装置が適切な通信モジュール（内蔵モジュール又は補助（例えばプラグイン）モジュールであってよい）を備えていれば、ケーブル又は無線リンク（例えばブルートゥース接続）を介して、この他の装置に電子機器を接続することによって実現できるであろう。楽曲ファイルは、１つ又はそれより多い移動電子機器から１つ以上の再生装置へ、１つずつ送信されるであろう。
【発明の開示】
【０００３】
本発明の実施形態によれば、移動無線通信端末は無線通信モジュール及びコントローラを含む。無線通信モジュールは他の通信端末と無線インタフェースを介して通信するように構成される。コントローラは、無線通信モジュールを介して参加無線通信端末とコネクションを確立し、再生すべき楽曲ファイルを示すプレイリストを保守し、参加無線通信端末に保存されている参加楽曲ファイルと対応する参加楽曲ＩＤを参加無線通信端末から受信し、参加楽曲ＩＤをプレイリストに追加し、そしてその後、再生のために参加楽曲ファイルを参加無線通信端末から読み出すことを含む、プレイリストで示される楽曲ファイルの再生を実行するように構成される。
【０００４】
コントローラは複数の参加無線通信端末とコネクションを確立し、それぞれが個々の参

加無線通信端末に保存されている個々の参加楽曲ファイルと対応する複数の参加楽曲ＩＤを複数の参加無線通信端末から受信し、各参加楽曲ＩＤをプレイリストに追加し、各参加無線通信端末から、再生のために参加楽曲ファイルを読み出すように構成されても良い。

【０００５】

一実施形態によれば、コントローラは参加無線通信端末からストリーミング音楽ファイルとして参加楽曲ファイルを読み出し並びに実行するように構成される。

【０００６】

一実施形態によれば、コントローラは参加楽曲ファイルを参加無線通信端末から読み出し、参加楽曲ファイルを無線通信端末に保存し、その後、保存した参加楽曲ファイルの再生を実行するように構成される。

【０００７】

コントローラは、プレイリストで示される楽曲ファイルをメディアセンタで再生するため、再生信号をメディアセンタに送信するように構成されても良い。

【０００８】

一実施形態によれば、無線通信端末は音響変換器を含む。コントローラはプレイリストで示される楽曲ファイルを音響変換器を用いて再生するように構成される。

【０００９】

コントローラはプレイリストで示される楽曲ファイルを少なくとも１つの参加無線通信端末で再生するため、再生信号を少なくとも１つの参加無線通信端末に送信するように構成されても良い。

【００１０】

コントローラは、参加無線通信端末に保存されている利用可能な楽曲ファイルを示す楽曲カタログを参加無線通信端末から受信し、利用可能な楽曲ファイルから選択するユーザ入力を受信し、選択された入手可能な楽曲をプレイリストに加えるように構成されても良い。

【００１１】

一実施形態によれば、コントローラは参加無線通信端末に、参加無線通信端末上にプレイリストを表示するための、プレイリストを表すリスト信号を送信するように構成される。

【００１２】

コントローラはプレイリストをユーザ入力に応答して変更するように構成されても良い。

【００１３】

一実施形態によれば、無線通信モジュールは他の通信端末と直接ポイントツーポイント無線インタフェースを介して通信するように構成される。コントローラは参加無線通信端末とコネクションを確立し、参加楽曲ＩＤを参加無線通信端末から受信し、再生のために、参加楽曲ファイルの全てを直接ポイントツーポイント無線インタフェースを介して参加無線通信端末から読み出すように構成される。

【００１４】

一実施形態によれば、無線通信モジュールは短距離送信器を備える。コントローラは参加無線通信端末とコネクションを確立し、参加楽曲ＩＤを参加無線通信端末から受信し、再生のために、参加楽曲ファイルの全てを短距離送信器を介して参加無線通信端末から読み出すように構成される。短距離送信器はブルートゥース（商標）送信器であってよい。

【００１５】

無線通信端末は、携帯電話機を含みうる。

【００１６】

本発明の他の実施形態によれば、楽曲プレイリストを提供するシステムが、ホスト移動無線通信端末と、参加無線通信端末とを含む。ホスト無線通信端末は無線通信モジュール及びコントローラを含む。無線通信モジュールは他の通信端末と無線インタフェースを介して通信するように構成される。コントローラは、無線通信モジュールを介して参加無線

通信端末とコネクションを確立し、再生すべき楽曲ファイルを示すプレイリストを保守し、参加無線通信端末に保存されている参加楽曲ファイルと対応する参加楽曲ＩＤを参加無線通信端末から受信し、参加楽曲ＩＤをプレイリストに追加し、そしてその後、再生のための参加楽曲ファイルの参加無線通信端末からの読み出しを含む、プレイリストで示される楽曲ファイルの再生を実行するように構成される。

【００１７】

一実施形態によれば、システムは複数の参加無線通信端末を含む。コントローラは複数の参加無線通信端末の各々とコネクションを確立し、それぞれが個々の参加無線通信端末に保存されている個々の参加楽曲ファイルと対応する複数の参加楽曲ＩＤを複数の参加無線通信端末から受信し、各参加楽曲ＩＤをプレイリストに追加し、各参加無線通信端末から、再生のために参加楽曲ファイルを読み出すように構成される。

【００１８】

本発明の他の実施形態によれば、ホスト無線通信端末を用いて楽曲プレイリストを提供する方法が、以下のステップを含む。ホスト無線通信端末と参加無線通信端末との間で無線コネクションを確立し、再生すべき楽曲ファイルを示すプレイリストをホスト無線通信端末を用いて保守し、ホスト無線通信端末において、参加無線通信端末に保存されている参加楽曲ファイルと対応する参加楽曲ＩＤを参加無線通信端末から受信し、参加楽曲ＩＤをプレイリストに追加し、その後、再生のために参加楽曲ファイルを参加無線通信端末から読み出すことを含む、プレイリストによって示される楽曲ファイルの再生を実行する。

【００１９】

本発明の別の実施形態によれば、ホスト無線通信端末を用いて楽曲プレイリストを提供するコンピュータプログラム製品が、コンピュータが使用可能なプログラムコードが実装されたコンピュータ利用可能な媒体を含み、コンピュータが利用可能なプログラムコードが、ホスト無線通信端末と参加無線通信端末との間で無線コネクションを確立するように構成されたコンピュータ利用可能なプログラムコードと、再生すべき楽曲ファイルを示すプレイリストをホスト無線通信端末を用いて保守するように構成されたコンピュータ利用可能なプログラムコードと、ホスト無線通信端末において、参加無線通信端末に保存されている参加楽曲ファイルと対応する参加楽曲ＩＤを、参加無線通信端末から受信するように構成されたコンピュータ利用可能なプログラムコードと、参加楽曲ＩＤをプレイリストに追加するように構成されたコンピュータ利用可能なプログラムコードと、その後、再生のために参加楽曲ファイルを参加無線通信端末から読み出すことを含む、プレイリストによって示される楽曲ファイルの再生を実行するように構成されたコンピュータ利用可能なプログラムコード。

【００２０】

本技術分野に属する当業者は、本発明の別の特徴、利点及び詳細を、図面及び以下の好ましい実施形態の詳細な説明を読むことにより理解するであろう。しかしながら、以下の説明は本発明の単なる例証に過ぎない。

【発明を実施するための最良の形態】

【００２１】

以下、本発明の実施形態を示す添付図面を参照して、本発明をより詳細に説明する。しかしながら、本発明はここで説明する実施形態に限定解釈されるべきではない。むしろ、これら実施形態は本明細書の開示が十分且つ完全となるように、そして本発明の範囲を本技術分野の当業者に十分伝えるように提供されるものである。図面を通じて同様の数字は同様の要素を示す。

【００２２】

本明細書において、「備える」とは、非限定的な表現であり、記載された特徴、整数、要素、ステップ、部品又は機能の１つ又は複数を含むが、他の特徴、整数、要素、ステップ、部品、機能の１つ以上又はそれらのグループの存在や追加を排除しないものとして使用される。

【００２３】

本明細書において、「及び／又は」という語は、１つ又は複数の関連する記載項目の任意かつ全ての組み合わせを含むものとして使用される。

【００２４】

本明細書において、ラテン語の「例を挙げると」という句から派生した「例えば」という略語は、前に記載した項目の一般的な１つ以上の例を紹介又は特定するために用いられ、それら項目の限定を意図したものではない。また、本明細書でラテン語の「言い換えれば」という句から派生した「即ち」という一般的な略語が用いられた場合、より一般的な記載から、具体的な項目を特定するために用いられる。

【００２５】

本明細書における専門用語は、特定の実施形態の説明のみを目的としたものであり、本発明を限定する意図はない。本明細書において、そうでないことが明記されない限り、単数形の表記は複数形を含むことが意図されている。

【００２６】

逆の規定がない限り、本明細書で用いられる全ての語（技術用語、科学用語を含む）は、本発明が属する技術分野における当業者による通常の理解と同義である。一般的に用いられている辞書で規定されているような用語は、関連技術分野における意味と整合する意味を有するものとして解されるべきであり、明示的に規定される場合を除き、理想化された、又は過度に形式的な意味に解されない。

【００２７】

本明細書において、ある要素が他の要素と「結合」又は「接続」されていると表現される場合、その要素は他の要素と直接結合又は接続されていても良いし、介在要素が存在していても良い。一方、ある要素が他の要素と「直接結合」又は「直接接続」されていると表現される場合には、介在要素は存在しない。さらに、「結合」又は「接続」されているとの表現は、無線的に結合又は接続されている状態を含みうる。

【００２８】

周知の機能及び構成については、簡潔さ及び／又は明瞭さのためにその詳細について説明を省略する。

【００２９】

本発明は方法、電子機器、及び／又はコンピュータプログラム製品として実施されうる。従って、本発明は、ハードウェア及び／又はソフトウェア（ファームウェア、常駐ソフトウェア、マイクロコード等を含む）の形式で実施可能であり、これらは本明細書において「回路」又は「モジュール」と総称する。さらに、本発明は、命令実行システムによって、あるいは命令実行システムとともに用いるための、コンピュータ利用可能又はコンピュータ読み取り可能な記録媒体上のコンピュータプログラム製品であって、記録媒体に実装されたコンピュータ利用可能又はコンピュータ読み取り可能なプログラムコードを有するコンピュータプログラム製品の形態を取りうる。この文脈において、コンピュータ利用可能又はコンピュータ読み取り可能な媒体とは、命令実行システム、装置又はデバイスによって、あるいはそれらと共に用いるためのプログラムを格納、保存、通信、伝播、又は伝送可能な任意の媒体であって良い。

【００３０】

以下、本発明のいくつかの実施形態について、方法及び無線端末のブロック図及び／又は動作説明図を参照して説明する。この点に関し、各ブロックは、記載された１つ以上の論理的な動作を実現するための１つ以上の実行可能な命令を備えるモジュール、セグメント又はコード部分を表しうる。なお、ブロック図及び／又は動作説明図の各ブロック及び、ブロック図及び／又は動作説明図におけるブロックの組み合わせは、無線周波数、アナログ及び／又はデジタルハードウェア，及び／又はプログラム命令によって実施可能であることを理解されたい。これらプログラム命令は汎用コンピュータ、特定用途向けコンピュータ、ＡＳＩＣ、及び／又はプログラム可能な他のデータ処理装置の１つ以上を含みうるコントローラに与えられることができ、これらの命令は、コントローラ及び／又は他のプログラム可能なデータ処理装置を介して、ブロック図及び／又は１つ以上の動作ブロッ

クに記載される機能／動作を実行するための手段を生成する。ある代替実施形態において、複数のブロックに記載されている機能／動作は、動作説明図とは異なる順序に発生しうる。例えば、連続して記載された２つのブロックは、関連する機能／動作に応じ、実質的に同時に実行されたり、逆の順序で実行されたりすることがありうる。

【００３１】

コンピュータプログラム命令は、コンピュータ利用可能又はコンピュータ読み取り可能なメモリ内に格納され、コンピュータ利用可能又はコンピュータ読み取り可能なメモリに格納された命令が、フローチャート及び／又はブロック図の１つ以上のブロックに記載される機能を実行する命令を含む製品(article of manufacture)を生成するようにして、コンピュータ又は他のプログラム可能なデータ処理装置を、特定の方法で機能するように命令することができる。

【００３２】

コンピュータ利用可能又はコンピュータ読み取り可能な媒体を非限定的に例示すれば、電気、磁気、光学、電磁気、赤外線、又は半導体のシステム、装置、デバイス、又は伝播媒体であってよい。コンピュータ読み取り可能な媒体のより具体的な例（限定的なリスト）は、以下の物を含む。ハードディスク、光学式記憶装置、インターネット又はイントラネットをサポートするような伝送媒体、磁気記憶装置、１つ以上の配線を有する電気的な接続、ポータブルコンピュータディスケット、ランダムアクセスメモリ（ＲＡＭ）、読み出し専用メモリ（ＲＯＭ）、消去可能なプログラマブル読み出し専用メモリ（ＥＰＲＯＭ又はフラッシュメモリ）、光ファイバ、コンパクトディスク読み出し専用メモリ（ＣＤ－ＲＯＭ）。

【００３３】

本発明の動作を実行するためのコンピュータプログラムコードは、Java（登録商標）、Smalltalk又はC++のようなオブジェクト指向プログラミング言語で記述することができる。しかし、本発明の動作を実行するためのコンピュータプログラムコードは、プログラミング言語Ｃ及び／又はより低レベルなアセンブラ言語のような、従前からある手続き型プログラミング言語によっても記述可能である。任意又は全てのプログラムモジュールの機能が、個別のハードウェア要素、１つ以上の特定用途向け集積回路(ASIC)、又はプログラミングされたデジタルシグナルプロセッサ又はマイクロコントローラを用いても実施可能であることもまた理解されよう。

【００３４】

本明細書において「電子部品」とは、電気コネクタなどの受動素子とは対照的に、能動素子を意味するものとして用いられる。電子部品はプロセッサを含みうる。

【００３５】

本明細書において「ストリーミングされた」又は「ストリーミング」は、音声又は楽曲ファイルのようなファイルが、デジタル信号によって受信装置に連続的に送信され、受信装置において、適切な受信アプリケーションを通じ、音声又は楽曲ファイルが同時再生されることを意味するものとして用いられる。デジタル信号は通常バッファされる。

【００３６】

本明細書における「通信端末」は、公衆交換電話網(PSTN)、デジタル加入者線(DSL)、デジタルケーブル又は他のデータ接続／ネットワークのような有線接続、及び／又は無線インタフェースを介して、例えばセルラネットワーク、衛星ネットワーク、無線ローカルエリアネットワーク(WLAN)及び／又は他の通信端末と通信信号を送受信するように構成された端末を含むが、それに限定されない。

【００３７】

通信端末が無線インタフェースを通じて通信するように構成される場合、本明細書では、「無線通信端末」又は「無線端末」と呼ぶ。無線端末の非限定的な例としては、携帯電話機、携帯情報端末(PDA)、ポケットベル、及び／又は、無線通信インタフェースを通じてデータ通信するように構成されたコンピュータを含む。無線通信インタフェースは、セルラ電話機インタフェース、ブルートゥースインタフェース、無線ローカルエリアネット

ワークインタフェース（例えば802.11）、他のＲＦ通信インタフェース及び／又は光学／赤外線通信インタフェースを含みうる。

【００３８】

本明細書において「移動端末」は、携帯型、可搬型、（航空、海上、陸上）車両設置型であっても、地球上及び／又は宇宙の任意の１つ以上の場所で局所的及び／又は分散的に動作するように設置及び／又は構成されてもよい。

【００３９】

本発明の実施形態を、図１～図６に関して以下説明する。本発明の実施形態は、他の無線通信端末からの１つ又はそれより多い楽曲識別情報(ID)を含む楽曲プレイリストを提供可能な移動無線通信端末を提供する。

【００４０】

図１は、本発明の一実施形態に係る例示的な無線通信端末１０Ａを示す図である。無線端末１０Ａは、１つ又はそれより多い他の無線端末と、相互間の直接無線通信インタフェース、１つ又はそれより多いセルラ基地局を通じた別の無線通信インタフェース及び／又は無線ローカルエリアネットワーク(WLAN)ルータを通じた別の無線通信インタフェースを通じてデータを通信するように構成される。無線端末１０Ａは、図１に示すように、無線電話通信システム２の一部を形成する移動無線電話機であってよい。システム２は移動無線通信端末１０Ａ及び、無線通信ネットワーク５の一部である基地局送受信器を含む。本発明の一実施形態において、ネットワーク５は、セルラネットワークにおける個々のセルを規定するとともに、無線リンクプロトコルを用いて（インタフェース７を介して）移動端末１０Ａ及び、セル内の他の移動端末と通信する１つ以上の無線送受信器を含む基地局送受信器を含む。本発明の一実施形態において、無線通信ネットワーク５を規定するため、多数の基地局送受信器が例えば移動交換局や他の装置を介して接続されていても良いことが理解されよう。

【００４１】

図示した実施形態において、移動端末１０Ａは、携帯型筐体アセンブリ１２、ディスプレイ２０、スピーカ２４（すなわち音響変換器）を含むユーザインタフェース２２（すなわち、マンマシーンインタフェース(MMI)）、コントローラ３０、通信モジュール３２、及びメモリ３４を含んでいる。移動端末１０Ａの上述した構成要素は、おそらく多くの一般的な移動端末に含まれており、その機能については本技術分野に属する当業者に広く知られている。移動端末１０Ａはさらに、メモリ３４に格納されてもよい楽曲管理モジュール４０を含む。

【００４２】

ディスプレイ２０は任意の適切な表示画面アセンブリであってよい。例えば、表示画面２８は外部光源（例えば発光パネル）を有する、又は有さない液晶ディスプレイ(LCD)であってよい。

【００４３】

ユーザインタフェース２２は例えば、接触活性型又は接触関知型デバイス（例えばタッチスクリーン）、ジョイスティック、キーボード／キーパッド、ダイアル、（１つ以上の）方向キー、及び／又はポインティングデバイス（マウス、トラックボール、タッチパッドなど）を含む、任意の適切な（１つ以上の）入力デバイスを含みうる。スピーカ２４は入力音声信号に応じた音声を生成する。ユーザインタフェース２２はさらに、マイクへの入力音声に応じて音声データストリームを生成するように構成された音声プロセッサと接続されるマイクを含んでも良い。

【００４４】

コントローラ３０は移動端末１０Ａの様々な機能をサポートしうる。コントローラ３０は、例えば、任意の市販又はカスタムマイクロプロセッサであってよい。使用時、移動端末１０Ａのコントローラ３０は、ディスプレイ２０上に表示画像を生成する。

【００４５】

メモリ３４はデジタル音声信号及び／又はデジタル音声ファイルのような、デジタル情

報信号及びデータを格納するように構成される。

【００４６】

通信モジュール３２は、ここで説明するように、１つ又はそれより多い無線インタフェース（例えば、本明細書における無線インタフェース７，１１２，１１４，１１６，１２２，及び１３４（図１及び図３参照））を通じて、他のリモート無線端末とデータを通信するように構成される。通信モジュール３２は、セルラ通信モジュール、直接ポイントツーポイント接続モジュール、及び／又はＷＬＡＮモジュールを含むことができる。

【００４７】

セルラ通信モジュールにより、無線端末１０Ａはネットワーク５の（１つ以上の）基地局を介して、（例えば、AMPS(Advanced Mobile Phone Service)、ANSI-136, GSM (Global Standard for Mobile communication), GPRS (General Packet Radio Service), EDGE (enhanced data rates for GSM evolution), 符号分割多元アクセス(CDMA), 広帯域CDMA, CDMA2000, UMTS (Universal Mobile Telecommunications System)のような）１つ又はそれより多いセルラ通信プロトコルを用いて通信することができる。セルラ基地局は移動電話交換局(MTSO)無線ネットワークに接続されうる。そして、さらにその先で、PSTN及び／又は他のネットワークにも接続されうる。

【００４８】

直接ポイントツーポイント接続モジュールは、直接ＲＦ通信モジュール又は直接ＩＲ通信モジュールを含みうる。直接ＲＦ通信モジュールは、ブルートゥースモジュールを含みうる。ブルートゥースモジュールを用いることで、無線端末１０Ａは直接ポイントツーポイントインタフェースを通じ、アドホックネットワークを介した通信が可能である。

【００４９】

ＷＬＡＮモジュールにより、無線端末１０Ａは、（802.11a, 802.11b, 802.11e, 802.11g及び／又は802.11iを非限定的な例示として含みうる）通信プロトコルを用い、ＷＬＡＮ（例えばルータ（図３））を通じて通信可能である。

【００５０】

一般に、通信モジュール３２は、送信器回路及び受信器回路を有する送受信器を含むことができる。送信器回路及び受信器回路はそれぞれ、アンテナを介し、音声及びデータ信号の様な（例えばネットワーク５、ルータ又は直接他の端末へ向かう）出方向無線周波数信号を送信し、（例えばネットワーク５、ルータ又は直接他の端末から到来する）入来無線周波数信号を受信する。通信モジュール３２はブルートゥース送信器及び受信器のような、短距離送信器及び受信器を含んでも良い。アンテナは本発明の範囲内において、埋め込みアンテナ、リトラクタブルアンテナ又は本技術分野に属する当業者に知られる任意のアンテナであってよい。移動端末１０Ａとネットワーク５、ルータ又は他の端末との間で伝送される無線周波数信号は、トラフィック信号及び制御信号（例えば、入来呼用の呼び出し信号／メッセージ）の両方を含みうる。これらの信号は通話先や送信先との通信を確立したり維持したりするのに用いられる。無線周波数信号はさらに、例えばセルラデジタルパケットデータ(CDPD)情報のような、パケットデータ情報を含みうる。加えて、送受信器は、IRポートを介して赤外線信号を他の電子機器との間で送受信するように構成される赤外線(IR)送受信器を含みうる。

【００５１】

移動端末１０Ａはまた、他の端末との間でデジタル通信信号を伝送するための有線又はケーブルを介して他の端末と電気的に接続されても良い。移動端末１０Ａは、入射光に基づいて静止画及び／又は動画データストリームを生成する様に構成されたカメラデバイスのような他の構成要素を含みうる。

【００５２】

一実施形態によれば、移動端末１０Ａはハンドヘルド移動端末である。「ハンドヘルド移動端末」とは、一般の操作者が片手で使うのに適した大きさを有する移動端末を意味する。一実施形態によれば、ハンドヘルド移動端末１０Ａの総容積は約２００ｃｃ未満である。一実施形態によれば、ハンドヘルド移動端末１０Ａの総容積は約１００ｃｃ未満であ

る。一実施形態によれば、ハンドヘルド移動端末１０Ａの総容積は約５０ｃｃから１００ｃｃである。一実施形態によれば、ハンドヘルド移動端末１０Ａのいかなる外形寸法も２００ｍｍを超えない。

【００５３】

本発明の一実施形態に係る無線通信端末（例えば移動端末１０Ａ）を用いて楽曲プレイリストを提供する方法について、図２のフローチャートを参照して説明する。図２の実施形態を参照すると、方法は、ホスト無線通信端末と参加無線通信端末との間で無線コネクションを確立する工程を含む（ブロック７０）。プレイリストはホスト無線通信端末を用いて保守される（ブロック７２）。プレイリストは再生すべき楽曲ファイルを示している。参加無線通信端末からの参加楽曲ＩＤが、ホスト無線通信端末で受信される（ブロック７４）。参加楽曲ＩＤは、参加無線通信端末に保存されている参加楽曲ファイルと対応するか、参加楽曲ファイルを指定する。参加楽曲ＩＤはプレイリストに加えられる（ブロック７６）。その後、プレイリストで示される楽曲ファイルの再生が実行される（ブロック７８）。楽曲ファイルの再生の実行は、参加無線通信端末からの参加楽曲ファイルの読み出しを含む。

【００５４】

一実施形態によれば、ホスト無線通信端末と複数の参加無線通信端末と複数のコネクションが確立され、ホスト無線通信端末は複数の参加無線通信端末から複数の参加楽曲ＩＤを受信し、複数の参加楽曲ＩＤの各々をプレイリストに追加し、再生のために参加楽曲ファイルを複数の参加無線通信端末の各々から読み出す。一実施形態によれば、ホスト無線通信端末と参加無線通信端末との間のコネクションは、ブルートゥース無線ＲＦコネクションのような直接ポイントツーポイントインタフェースによって達成される。一実施形態によれば、ホスト無線通信端末と参加無線通信端末との間の通信は、ＷＬＡＮ又はセルラ方式のシステムのような間接インタフェースを介して達成される。本発明の他の見地及び実施形態は、以下に記載する他の実施形態の説明から明らかになるであろう。

【００５５】

図３に、本発明の実施形態に係る楽曲ファイル再生システム１００Ａを示す。システム１００Ａは、移動無線通信端末１０Ａ（「ホスト無線通信端末」又は「ホスト端末」とも呼ぶ）と、付加的な複数の参加無線通信端末１０Ｂ，１０Ｃ，１０Ｄ及び１０Ｅ（「参加無線通信端末」又は「参加端末」とも呼ぶ）と、メディアセンター１３０とを含む。

【００５６】

端末１０Ｂ－Ｅは、端末１０Ａに関して上述したような構成を有していても良い。端末１０Ｂ－Ｅの各々は、無線通信モジュール３２及び楽曲管理モジュール４０を含んでいる。しかし、個々の楽曲管理モジュールは、対象とする装置の機能に応じ、個々の端末１０Ａ－Ｅについて構成が異なっていても良い。一実施形態によれば、端末１０Ｂ－Ｅの全て又は一部は移動無線通信端末である。一実施形態によれば、端末１０Ａ－Ｅの全て又は一部はハンドヘルド移動無線通信端末である。

【００５７】

メディアセンター１３０は、音声信号（例えばデジタル音声信号）を対応する音声に変換するように構成された装置を含む。メディアセンター１３０は、例えば、ＰＣ又はラップトップ、テレビジョン受像機、オーディオレシーバ、ステレオ装置などを含みうる。図示のメディアセンター１３０は無線通信モジュール１３２及び複数の音声変換器（スピーカ）１３６を含んでいる。無線通信モジュール１３２はメディアセンター１３０と一体化されていても、スウェーデンのソニーエリクソン社から入手可能なBluetooth Media Viewer MMV-100モジュール又はBluetooth Media Viewer MMV-200のような、補助又はプラグイン無線通信モジュールであってもよい。

【００５８】

以下、システム１００Ａの使用例に関して説明する。集まった一群のユーザは、各々が端末１０Ａ－Ｅの１つを有している。様々な楽曲が、端末１０Ａ－Ｅの１つ又はそれより多く（通常２つ以上）に保存されている。ユーザは、自分たちの移動端末に保存された楽

曲をメディアセンター１３０で再生し、集まったユーザ同士で共有したいと思うだろう。これは各ユーザに（ブルートゥース等を介して）自分の所有する楽曲（すなわち、音楽オーディオファイル）を、メディアセンター１３０へ、１つずつ、一曲毎に送信させることで、既知かつ利用可能な技術により実現可能である。しかし、この方法は楽曲を送信するユーザ各々に、かなりの、かつ積極的なインタラクションを要求とする。そのような関与は、状況（例えばパーティ）によっては不便であったり及び／又は実現できないかもしれない。

【００５９】

本発明の実施形態によれば、ホスト端末１０Ａを用いて、楽曲のプレイリストを生成及び保守し、楽曲（すなわち音楽オーディオファイル）の再生を実行することによりこのような問題を解決することができる。通常、各端末１０Ａ－Ｅには、適切な楽曲管理モジュール４０（例えば、ソフトウェア又はファームウェアアプリケーション）がインストールされている。

【００６０】

ホスト端末１０Ａは、マスター又はホスト端末として選択され、参加端末１０Ｂ－Ｅはそれぞれスレーブ又は参加端末として指定される。ホスト端末１０Ａのコントローラ３０は、参加端末１０Ｂ－Ｅの各々と無線コネクションを確立する（すなわち、通信可能に接続する）。一実施形態によれば、無線コネクションは直接無線通信インタフェースコネクションであり、一実施形態によれば、直接ＲＦコネクションであって、また一実施形態によればブルートゥースコネクションである。コネクションは既知の方法によって確立されて良い。例えば、ブルートゥースコネクションの場合、参加（スレーブ）端末１０Ｂ－Ｅが探索可能／発見可能状態に設定され、ホスト（マスター）端末１０Ａが、ピコネット又はパーソナルエリアネットワークを形成するため、利用可能な参加（スレーブ）端末１０Ｂ－Ｅを特定するための問い合わせを発するであろう。

【００６１】

図示の通り、ホスト端末１０Ａは、参加端末１０Ｂ，１０Ｃ及び１０Ｄと、直接ポイントツーポイント無線インタフェース又はリンク１１２，１１４及び１１６を介してそれぞれ通信し、参加端末１０ＥとはＷＬＡＮルータ１２０を通じて無線インタフェース又はリンク１１８，１２２を介して通信する。一実施形態によれば、インタフェースは直接（例えばブルートゥース）又は間接（例えばＷＬＡＮルータ又はセルラネットワーク５を介する）無線インタフェースの様々な組み合わせであって良いことは明らかであろう。予定される一実施形態によれば、楽曲共有手順の実行のためにホスト端末１０Ａ及び参加端末１０Ｂ－Ｅとの間に与えられる全ての信号は、直接ポイントツーポイント無線インタフェースを介して与えられる。予定される一実施形態によれば、楽曲共有手順の実行のためにホスト端末１０Ａ及び参加端末との間に与えられる全ての信号は、ブルートゥースインタフェースのような直接無線周波数（ＲＦ）インタフェースを介して与えられる。

【００６２】

コネクションの確立前又は確立後、ホスト端末１０Ａは有効な参加端末を任意の好適な方法により特定し、指定する。一実施形態によれば、ホスト端末１０Ａは可能性のある参加端末（例えば、ホスト端末のブルートゥース信号の到達範囲内に存在する参加端末）の全てもしくは選択されたグループに対し、ポーリングするか、インビテーションを送信する。そして、可能性のある参加端末は、インビテーションの承認によって応答することで、選択(opt in)しても良いあるいは、又はそれに加えて、ホスト端末１０Ａは、参加端末からの自発的な参加要求を受け付けても良い。ホスト端末１０Ａは参加が許可されるであろう可能性のある参加端末（すなわち、プレイリストへ寄与する楽曲）のリストのような、特定のグループを規定するために用いられても良い。

【００６３】

ホスト端末１０Ａはさらに、無線インタフェース又はリンク１３４を介して通信モジュール１３２に無線楽曲データ信号を供給するため、メディアセンター１３０とも通信可能に接続されている。あるいは、ホスト端末１０Ａは、有線又は信号ケーブルを用いてメデ

ィアセンター１３０と接続されても良い。

【００６４】

ホスト端末１０Ａと参加端末１０Ｂ－Ｅとの間でコネクションが確立されると、各参加端末は、参加者の端末１０Ｂ－Ｅに保存されている楽曲を指定する参加楽曲ＩＤを送信可能となる。送信元参加端末１０Ｂ－Ｅの楽曲管理モジュール４０は楽曲ＩＤの選択及び送信を容易にするためのユーザインタフェースを提供することができる。例えば、モジュール４０は利用可能な保存楽曲とホスト端末１０Ａに送信する（１曲以上の）楽曲を選択するためのチェックボックスのリストを生成してもよい。

【００６５】

ホスト端末１０Ａは、参加端末１０Ｂ－Ｅから参加楽曲ＩＤを受信する。ホスト端末１０Ａの楽曲管理モジュール４０は、これら楽曲ＩＤのホストプレイリストを生成並びに保守する。ホストプレイリストは再生すべき楽曲ファイルを示す。

【００６６】

各楽曲管理モジュール４０は、関連する端末１０Ａ－Ｅ上に図４に示すような表示１５０を行う。ホスト端末１０Ａでの表示は、参加端末１０Ｂ－Ｅの表示とは異なっていて良い。例えば、表示１５０のうち、管理機能に関する部分は、参加端末の表示から省かれていて良い。あるいは、楽曲管理モジュール４０は参加端末１０Ｂ－Ｅには表示を行わなくても良い。

【００６７】

図示の実施形態において、表示１５０はプレイリストフィールド１５２及びコントロールボタン１５４（例えばソフトキー）を含んでいる。制御ボタン１５４は通常、ホスト端末表示にのみ表示されるであろう。プレイリスト１５６はプレイリストフィールド１５２に表示される。プレイリスト１５６は一列ずつ並んだ複数の楽曲ＩＤ１５６Ａを含み、楽曲ＩＤ１５６Ａの各々は個々の楽曲ファイルに対応する。図示の通り、各楽曲ＩＤは、関連づけられた楽曲ファイルに対応した曲アーティスト、曲名及び曲再生時間と、その楽曲ＩＤを送信した参加者のＩＤを含んでいる。なお、図示したより多くの、少ない及び／又は別の情報を同様に提供しうることが理解されよう。

【００６８】

ホストは楽曲リスト１５６で示される楽曲の再生を、例えばコントロールボタン１５４を用いて選択的に管理してもよい。例えば、「再生」及び「停止」ボタンはメディアセンター１３０への楽曲ファイルの送信を開始及び停止するために用いることができる。「移動」ボタンは、プレイリスト１５６中の楽曲ＩＤ１５６Ａに優先度を与えたり、順序を変更したりする（すなわち、関連付けられた楽曲ファイルの再生順序を変更する）ために用いることができる。「削除」ボタンはプレイリスト１５６からある楽曲ＩＤ１５６Ａを削除するために用いることができる。「詳細」ボタンは、関連付けされた楽曲ファイルが再生されないように、プレイリスト１５６から楽曲ＩＤ１５６Ａを削除するために用いることができる。「ランダムミックス」ボタンは、ホスト端末１０Ａに、楽曲ファイルの再生をランダム又は他の不連続な順序で実行させる（メディアセンター１３０へ楽曲ファイルを送信させる）ために用いることができる。通常、ホスト端末１０Ａはランダム又は他の不連続な順序モードが有効でない限り、リストされた順序で楽曲ファイルの再生を実行する。

【００６９】

さらに他の機能が提供されても良い。例えば、ホスト端末１０Ａは、選択された１つ又はそれより多い属性（例えば、提供者、曲の長さ、など）に従って、楽曲ＩＤの順序を変更することをユーザに許可しても良い。ホスト端末１０Ａは、参加端末１０Ｂ－Ｅのうち、楽曲ＩＤをプレイリスト１５６に追加することを許可される端末を指定するように構成されても良い。参加端末１０Ｂ－Ｅは、楽曲ＩＤの追加に加え、楽曲リスト１５６の編集又は変更を許可されても良い。この場合、ホスト端末１０Ａは、参加端末１０Ｂ－Ｅのうち、楽曲プレイリスト１５６の変更を許可されるものと、許可されないものとを（すなわち、参加端末のプレイリスト編集機能を有効にするか、無効にするかを）ホストが選択可

能なように構成されても良い。

【００７０】

ホスト端末１０Ａが再生モードの時、ホスト端末１０Ａのコントローラ３０は、後で再生すべき楽曲ＩＤ１５６Ａを特定する。特定された楽曲ＩＤは、次に再生すべき楽曲ＩＤかもしれない。すると、ホスト端末１０Ａは、楽曲ＩＤに対応する楽曲ファイルを読み出すため、楽曲ファイル要求を対応する参加端末１０Ｂ－Ｅに送信する。

【００７１】

対応する参加端末は、特定された楽曲ファイル（その参加端末に保存されている）のコピーをホスト端末１０Ａへ送信する。一実施形態によれば、参加端末が楽曲ファイルをホスト端末１０Ａに楽曲ファイルのコピーとして送信すると、ホスト端末１０Ａは楽曲ファイルのコピーを一時的に（例えばメモリ３４に）保存する。他の実施形態によれば、参加端末は楽曲ファイルをストリーミング楽曲ファイルとしてホスト端末１０Ａに送信する。一実施形態によれば、ホスト端末と参加端末との間の要求及び楽曲ファイル信号は無線で送信され、一実施形態によれば、ブルートゥースのような直接無線ＲＦコネクションを介して送信される。

【００７２】

ホスト端末１０Ａのコントローラ３０は、読み出した楽曲ファイルをメディアセンター１３０へ送信することによって、再生を実行する。楽曲ファイルは再生のためにメディアセンター１３０に保存されてもよい。あるいは、例えば楽曲ファイルの保存元の参加端末からホスト端末１０Ａに楽曲ファイルがストリーミングされたように、楽曲ファイルはメディアセンター１３０にストリーミングされてもよい。ホスト端末１０Ａに割り当てられたメモリ容量が不十分な場合及び／又は楽曲ファイルをホスト端末１０Ａに保存することが禁止されているか違法である場合には、楽曲ファイルを参加端末からホスト端末へ、及び／又はホスト端末からメディアセンター１３０へストリーミングすることが好ましいか、必要となるであろう。一実施形態によれば、楽曲ファイルは、ストリーミングされる場合も、全体が保存される場合も、再生中もしくは再生後にホスト端末１０Ａから自動的に（すなわち、ユーザの介入無しに）消去される。

【００７３】

ホスト端末１０Ａのコントローラ３０は、上述のステップを、楽曲ＩＤ１５６Ａの各々について、順番に、かつ自動的に（すなわち、ユーザの介入無しに）実行することができる。ホスト端末１０Ａがこのようにして楽曲リスト１５６を全体について処理したら、ホストはプレイリスト１５６を好きなように変更することができる。また、一実施形態によれば、参加端末１０Ｂ－Ｅは、ホスト端末１０Ａのコントローラ３０がプレイリスト１５６の処理を終えたら、新たな楽曲ＩＤを楽曲リスト１５６に追加することができる。一実施形態によれば、ホスト端末１０Ａがプレイリスト１５６の処理を終えたら、新たな参加端末がグループに加入し、楽曲ＩＤを送信することが可能になる。

【００７４】

システム１００Ａは、人々のグループによって選択された楽曲を再生するための便利で楽しい仕組みを提供することができる。システム１００Ａは再生実行機能を提供するとともに、ホスト端末（場合によっては参加端末）が、楽曲プレイリストの生成、調整、制御及び／又は管理を行うことを可能にする。実際には、例えば、パーティの参加者は、自分の参加端末からホスト端末（例えばパーティホストの移動端末）で保守されている楽曲プレイリストに楽曲を追加することができる。自分の所有する楽曲が再生される順番になると、楽曲ファイルのコピーが自動的にホスト端末に送信され、再生される。そのため、パーティの参加者は、曲を追加した後は何もする必要がない。一実施形態によれば、直接無線コネクション（例えばブルートゥースコネクションのようなＲＦインタフェース）を介してホスト端末と参加端末との間で要求及び楽曲転送信号が通信される場合、パーティの参加者は自分の参加端末を、ポケットやハンドバッグに入れておくだけでよい。参加者は、手順が実行されている間に追加もしくは除去されてもよい。例えば、参加者がブルートゥースの接続範囲から出た場合、その参加者の楽曲はプレイリストから削除されるか、プ

レイリスト中で下に移動される。

【００７５】

図５は、本発明の別の実施形態に係るシステム１００Ｂを示す図である。システム１００Ｂは、ホスト端末１０Ａと、複数の参加端末１０Ｂ－Ｅを含んでいる。システム１００Ｂは、メディアセンター１３０が無く、楽曲プレイリスト１５６からの楽曲ファイルの再生がホスト端末１０Ａのスピーカ２４を介して実行される点において、システム１００Ａ（図２）と異なる。

【００７６】

図６は、本発明の別の実施形態に係るシステム１００Ｃを示す図である。システム１００Ｃは、ホスト端末１０Ａと、複数の参加端末１０Ｂ－Ｅを含んでいる。システム１００Ｃは、楽曲プレイリスト１５６からの楽曲ファイルの再生がホスト端末１０Ａのスピーカ２４を介して実行されることに加え、複数の参加端末１０Ｂ－Ｅの各々のスピーカ及び／又は複数の参加端末１０Ｂ－Ｅに動作可能に接続された１つ又はそれより多いヘッドセット（例えばインナーイヤー型ステレオヘッドセット）を通じて実行される点において、システム１００Ｂ（図５）と異なる。より具体的には、ホスト端末１０Ａのコントローラ３０は上述した方法で各楽曲ファイルを再生し、さらにその楽曲ファイルを同時再生のために参加端末１０Ｂ－Ｅに送信する。従って、ホスト端末１０Ａは、参加端末１０Ｂ－Ｅからの楽曲ＩＤを含みうる楽曲プレイリストを生成及び保守し、楽曲ファイルのコピーを必要に応じて適切な参加端末１０Ｂ－Ｅから読み出し、その楽曲ファイルのコピーを再生のために参加端末１０Ｂ－Ｅに配信する。一実施形態によれば、ホスト端末１０Ａから参加端末１０Ｂ－Ｅへ送信される楽曲転送信号は無線で送信され、一実施形態によれば、ブルートゥースのような直接無線ＲＦコネクションを介して送信される。一実施形態によれば、楽曲ファイルは、参加端末１０Ｂ－Ｅへストリーミングされる。ホスト端末１０Ａは、参加端末１０Ｂ－Ｅのうち、再生信号を受信するもの及び、プレイリスト１５６に楽曲ＩＤを追加することを許可するものをホストが指定可能なように構成されても良い。なお、再生信号を受信する参加端末のグループと、プレイリスト１５６に楽曲ＩＤを追加することを許可する参加端末のグループとは異なっていても良い。

【００７７】

ホスト端末１０Ａは、上述した様々なオプションから、再生のための装置または装置の組み合わせを選択的に選べるように構成されても良い。例えば、ホスト端末１０Ａは、再生を、自身のスピーカ２４を通じてのみ、自身のスピーカ及び参加端末１０Ｂ－Ｅのスピーカを通じて、参加端末１０Ｂ－Ｅのスピーカ及びメディアセンター１３０を通じて、等で行うように構成されても良い。楽曲ファイルが参加端末１０Ｂ－Ｅのスピーカを通じて再生される場合、これら参加端末の所与の１つのユーザは、自身の端末のスピーカを無効にしたり及び／又は他の装置（例えば、関連付けられた他のメディアセンターなど）で再生するために楽曲ファイルを中継したりしてもよい。

【００７８】

別の実施形態によれば、ホスト端末１０Ａのコントローラ３０は、ある参加端末に対して楽曲カタログリストを要求したり及び／又は自発的な楽曲カタログリストを受け付けたりしても良い。楽曲カタログリストは、その参加端末上の各楽曲ファイルを示す楽曲ＩＤ又は、その参加端末が利用可能することを希望する全ての楽曲についての楽曲ＩＤを含む。ホスト端末１０Ａはその後、プレイリストに追加したいと思う楽曲カタログリストの楽曲ＩＤをホストに選択することを可能にしても良い。

【００７９】

楽曲管理モジュール４０を含む、ここで説明したアプリケーションプログラムは、本発明の実施形態に係る様々な機能を実施するプログラムの例示である。本発明の実施形態に従って、他の及び／又は更なるアプリケーションプログラムが用いられうることが理解されよう。

【００８０】

図１には、楽曲ファイルを管理及び再生するための移動端末及び／又は他の電子機器に

おいて使用可能であろう例示的なハードウェア／ソフトウェア構造を示したが、本発明はそのような構成に限定されず、ここで説明した動作を実行可能な任意の構成の包含が意図されていることが理解されよう。例えば、メモリ３４はコントローラ３０と別個に図示されているが、メモリ３４又はその一部がコントローラ３０の一部であると見なしても良い。より一般的には、特定の複数のブロックにおいて特定の複数の機能が例示されていても、それらの異なる複数のブロック及び／又は複数の部分は、結合、分割、及び／又は削除されうる。さらに、図１のハードウェア／ソフトウェア構造の機能は、本発明の様々な実施形態に従ってシングルプロセッサシステム又はマルチプロセッサシステムとして実施可能である。

【００８１】

本明細書の開示から利益を享受する本技術分野に属する当業者は、本発明の精神及び範囲内において様々な変更及び改変を行うことができる。従って、ここで説明してきた例示的な実施形態は単に例示を目的としたものと解釈されなければならず、以下の請求項によって規定される本発明を限定するものと解釈されるべきではない。従って、以下の請求項は、文言で説明された要素の組み合わせに限らず、実質的に同一の結果を得るために実質的に同じ方法で実質的に同じ機能を実行するための全ての等価物を含むように解釈されるべきである。従って、請求項は具体的に図示され、説明されたもの、概念的に等価な物及び、本発明の基本的な思想を組み込んだものを含むものと解されるべきである。

【図面の簡単な説明】

【００８２】

【図１】本発明の一実施形態に係る移動無線通信端末及び、例示的な基地局送受信器を模式的に示す図である。

【図２】本発明の一実施形態に係る方法を示すフローチャートである。

【図３】図１の無線通信端末を含む、本発明の一実施形態に係る楽曲ファイル再生システムを模式的に示す図である。

【図４】本発明の一実施形態に係る、図１の無線通信端末の表示を模式的に示す図である。

【図５】図１の無線通信端末を含む、本発明の別の実施形態に係る楽曲ファイル再生システムを模式的に示す図である。

【図６】図１の無線通信端末を含む、本発明の別の実施形態に係る楽曲ファイル再生システムを模式的に示す図である。

【図１】

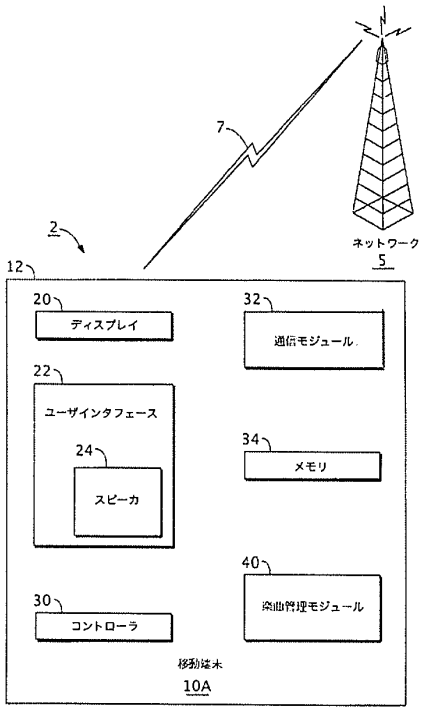



FIG. 1

【図２】

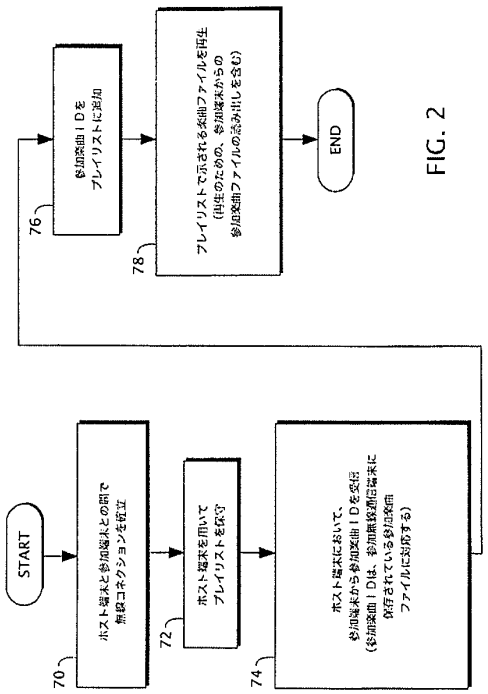



FIG. 2

【図３】

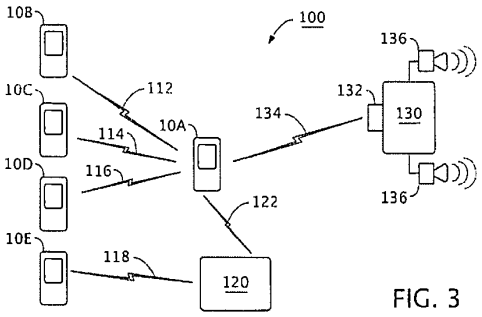



FIG. 3

【図４】

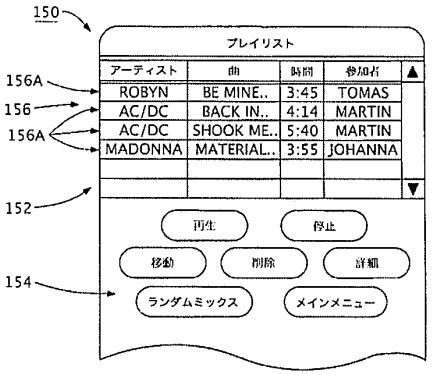



FIG. 4

【図５】

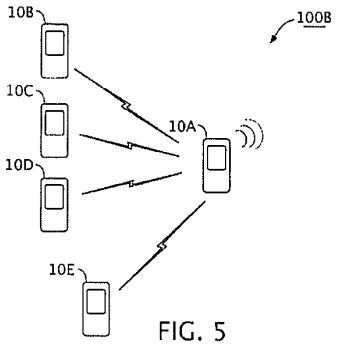



FIG. 5

【図６】

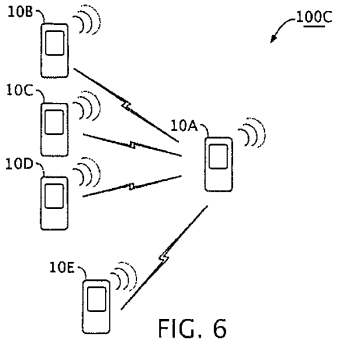



FIG. 6

【手続補正書】
【提出日】平成19年6月28日(2007.6.28)
【手続補正１】
【補正対象書類名】特許請求の範囲
【補正対象項目名】全文
【補正方法】変更
【補正の内容】
【特許請求の範囲】
【請求項１】
移動無線通信端末であって、無線インタフェースを通じて他の複数の通信端末と通信するように構成された無線通信モジュールと、
前記無線通信モジュールを介して参加無線通信端末とコネクションを確立し、再生すべき楽曲ファイルを示すプレイリストを保守し、前記参加無線通信端末に保存されている参加楽曲ファイルと対応する参加楽曲ＩＤを前記参加無線通信端末から受信し、前記参加楽曲ＩＤを前記プレイリストに追加し、その後、再生のための前記参加楽曲ファイルの前記参加無線通信端末からの読み出しを含む、前記プレイリストで示される前記楽曲ファイルの再生を実行するように構成されたコントローラとを有することを特徴とする移動無線通信端末。
【請求項２】
前記コントローラが、前記無線通信モジュールを介して複数の参加無線通信端末とコネクションを確立し、前記複数の参加無線通信端末から、前記複数の参加無線通信端末の各々に保存されている個別の参加楽曲ファイルに対応する参加楽曲ＩＤを複数受信し、前記複数の参加楽曲ＩＤの各々をプレイリストに追加し、前記複数の参加無線通信端末の各々から、再生のために複数の前記参加楽曲ファイルを読み出すように構成されることを特徴とする請求項１記載の移動無線通信端末。

【請求項３】
前記コントローラが、前記参加無線通信端末からストリーミング音楽ファイルとして前記参加楽曲ファイルを読み出し、前記参加楽曲ファイルが前記移動無線通信端末にストリーミングされている際に前記参加楽曲ファイルの再生を実行するように構成されることを特徴とする請求項１又は請求項２記載の移動無線通信端末。
【請求項４】
前記コントローラが、前記参加楽曲ファイルを前記参加無線通信端末から読み出し、前記参加楽曲ファイルを前記無線通信端末に保存し、その後、前記保存した参加楽曲ファイルの再生を実行するように構成されることを特徴とする請求項１又は請求項２記載の移動無線通信端末。
【請求項５】
前記コントローラが、前記プレイリストで示される前記楽曲ファイルをメディアセンタで再生するために、再生信号を前記メディアセンタに送信するように構成されることを特徴とする請求項１乃至請求項４のいずれか１項に記載の移動無線通信端末。
【請求項６】
音響変換器をさらに含み、前記コントローラが、前記プレイリストで示される前記楽曲ファイルを前記音響変換器を用いて再生するように構成されることを特徴とする請求項１乃至請求項５のいずれか１項に記載の移動無線通信端末。
【請求項７】
前記コントローラが、前記プレイリストで示される前記楽曲ファイルを少なくとも１つの参加無線通信端末で再生するため、再生信号を少なくとも１つの参加無線通信端末に送信するように構成されることを特徴とする請求項１乃至請求項６のいずれか１項に記載の移動無線通信端末。
【請求項８】
前記コントローラが、前記無線通信モジュールを介して複数の参加無線通信端末とコネクションを確立し、前記プレイリストによって示される前記楽曲ファイルを前記複数の参加無線通信端末で同時再生するために、再生信号を前記複数の参加無線通信端末の各々に送信するように構成されることを特徴とする請求項７記載の移動無線通信端末。
【請求項９】
音響変換器をさらに含み、
前記コントローラが、前記プレイリストによって示される前記楽曲ファイルを、前記音響変換器を用いて再生し、前記プレイリストによって示される前記楽曲ファイルを、少なくとも１つの参加無線通信端末で前記移動無線通信端末の前記音響変換器を用いた再生と同時再生するために、再生信号を前記少なくとも１つの参加無線通信端末へ送信するように構成されることを特徴とする請求項７記載の移動無線通信端末。
【請求項１０】
前記コントローラが、前記参加無線通信端末に保存されている利用可能な楽曲ファイルを示す楽曲カタログリストを前記参加無線通信端末から受信し、前記利用可能な楽曲ファイルから選択するユーザ入力を受信し、前記選択された入手可能な楽曲ファイルを前記プレイリストに追加するように構成されることを特徴とする請求項１乃至請求項９のいずれか１項に記載の移動無線通信端末。
【請求項１１】
前記コントローラが、前記プレイリストを前記参加無線通信端末で表示するため、前記プレイリストを表すリスト信号を前記参加無線通信端末に送信するように構成されることを特徴とする請求項１乃至請求項１０のいずれか１項に記載の移動無線通信端末。
【請求項１２】
前記コントローラが、ユーザ入力に応じて前記プレイリストを変更するように構成されることを特徴とする請求項１乃至請求項１１のいずれか１項に記載の移動無線通信端末。
【請求項１３】
前記無線通信モジュールが、他の複数の通信端末と直接ポイントツーポイント無線イン

タフェースを通じて通信するように構成されるとともに、
前記コントローラが、前記無線通信モジュールを介して前記参加無線通信端末との前記コネクションを確立し、前記参加無線通信端末から前記参加楽曲ＩＤを受信し、再生のために、前記参加楽曲ファイルの全てを前記直接ポイントツーポイント無線インタフェースを介して前記参加無線通信端末から読み出すように構成されることを特徴とする請求項１乃至請求項１２のいずれか１項に記載の移動無線通信端末。
【請求項１４】
前記無線通信モジュールが、短距離送信器を備えるとともに、
前記コントローラが、前記参加無線通信端末と前記コネクションを確立し、前記参加楽曲ＩＤを前記参加無線通信端末から受信し、再生のために、前記参加楽曲ファイルの全てを前記短距離送信器を介して前記参加無線通信端末から読み出すように構成されることを特徴とする請求項１乃至請求項１３のいずれか１項に記載の移動無線通信端末。
【請求項１５】
前記短距離送信器がブルートゥース送信器であることを特徴とする請求項１４記載の移動無線通信端末。
【請求項１６】
前記コントローラが、前記移動無線通信端末をマスター端末として指定し、前記参加無線通信端末をスレーブ端末としてい指定し、前記移動無線通信端末及び前記参加無線通信端末を含む無線パーソナルエリアネットワークを確立するように動作することを特徴とする請求項１４又は請求項１５記載の移動無線通信端末。
【請求項１７】
前記コントローラが、利用可能な参加無線通信端末を特定するための問い合わせを発するように動作することを特徴とする請求項１６記載の移動無線通信端末。
【請求項１８】
前記コントローラが、前記プレイリストから選択された楽曲ＩＤを再生すべきものとして特定するように構成されるとともに、前記参加楽曲ＩＤが前記選択された楽曲ＩＤである場合、前記参加無線通信端末から前記参加楽曲ファイルを読み出すため、前記参加無線通信端末に楽曲ファイル要求を自動的に送信するように構成されることを特徴とする請求項１乃至請求項１７のいずれか１項に記載の移動無線通信端末。
【請求項１９】
前記無線通信端末が、携帯電話機を含むことを特徴とする請求項１乃至請求項１８のいずれか１項に記載の移動無線通信端末。
【請求項２０】
前記移動無線通信端末がハンドヘルド移動無線通信端末であることを特徴とする請求項１乃至請求項１９のいずれか１項に記載の移動無線通信端末。
【請求項２１】
楽曲プレイリストを提供するシステムであって、
ホスト移動無線通信端末と、
参加無線通信端末とを備え、
前記ホスト無線通信端末が、
無線インタフェースを通じて他の複数の通信端末と通信するように構成された無線通信モジュールと、
前記無線通信モジュールを介して前記参加無線通信端末とのコネクションを確立し、再生すべき楽曲ファイルを示すプレイリストを保守し、前記参加無線通信端末に保存されている参加楽曲ファイルと対応する参加楽曲ＩＤを前記参加無線通信端末から受信し、前記参加楽曲ＩＤを前記プレイリストに追加し、その後、再生のための前記参加楽曲ファイルの前記参加無線通信端末からの読み出しを含む、前記プレイリストで示される前記楽曲ファイルの再生を実行するように構成されたコントローラとを含むことを特徴とするシステム。
【請求項２２】

複数の参加無線通信端末を含み、前記コントローラが、前記無線通信モジュールを介して前記複数の参加無線通信端末の各々とコネクションを確立し、前記複数の参加無線通信端末から、前記複数の参加無線通信端末の各々に保存されている個別の参加楽曲ファイルに対応する参加楽曲ＩＤを複数受信し、前記複数の参加楽曲ＩＤの各々を前記プレイリストに追加し、前記複数の参加無線通信端末の各々から、再生のために複数の前記参加楽曲ファイルを読み出すように構成されることを特徴とする請求項２１記載のシステム。

【請求項２３】

ホスト無線通信端末を用いて楽曲プレイリストを提供するための方法であって、

前記ホスト無線通信端末と参加無線通信端末との間で無線コネクションを確立し、

再生すべき楽曲ファイルを示すプレイリストを前記ホスト無線通信端末を用いて保守し、

前記ホスト無線通信端末において、前記参加無線通信端末に保存されている参加楽曲ファイルと対応する参加楽曲ＩＤを前記参加無線通信端末から受信し、

前記参加楽曲ＩＤを前記プレイリストに追加し、その後、

再生のために前記参加楽曲ファイルを前記参加無線通信端末から読み出すことを含む、前記プレイリストによって示される前記楽曲ファイルの再生を実行することを特徴とする方法。

【請求項２４】

ホスト無線通信端末を用いて楽曲プレイリストを提供するためのコンピュータプログラム製品であって、

コンピュータが利用可能なプログラムコードが埋め込まれたコンピュータが利用可能な媒体を含み、前記コンピュータが利用可能なプログラムコードが、

前記ホスト無線通信端末と参加無線通信端末との間で無線コネクションを確立するように構成されたコンピュータ利用可能なプログラムコードと、

再生すべき楽曲ファイルを示すプレイリストを前記ホスト無線通信端末を用いて保守するように構成されたコンピュータ利用可能なプログラムコードと、

前記ホスト無線通信端末において、前記参加無線通信端末に保存されている参加楽曲ファイルと対応する参加楽曲ＩＤを参加無線通信端末から受信するように構成されたコンピュータ利用可能なプログラムコードと、

前記参加楽曲ＩＤを前記プレイリストに追加するように構成されたコンピュータ利用可能なプログラムコードと、

その後、再生のために前記参加楽曲ファイルを前記参加無線通信端末から読み出すことを含み、前記プレイリストによって示される前記楽曲ファイルの再生を実行するように構成されたコンピュータ利用可能なプログラムコードとを含むことを特徴とするコンピュータプログラム製品。

【手続補正２】

【補正対象書類名】図面

【補正対象項目名】図３

【補正方法】変更

【補正の内容】

【図３】

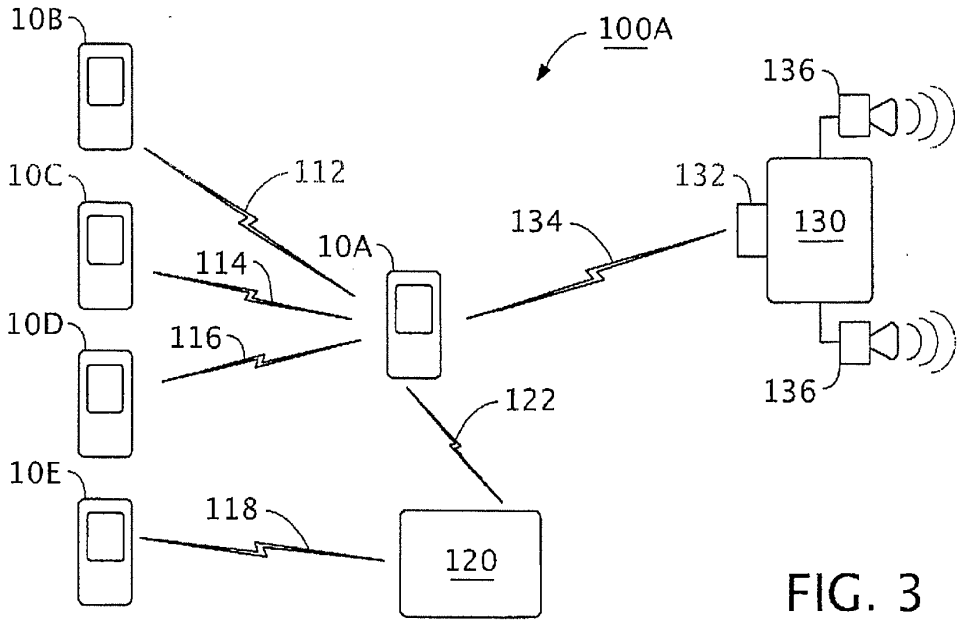

10B
100A
136
10C
112
132
134
130
10A
114
10D
116
122
136
10E
118
120

FIG. 3

【国際調査報告】

## INTERNATIONAL SEARCH REPORT

International application No
PCT/EP2006/065350

A. CLASSIFICATION OF SUBJECT MATTER
INV. H04L29/08

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)
H04L

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

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)
EPO-Internal, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

| Category* | Citation of document, with indication, where appropriate, of the relevant passages | Relevant to claim No. |
|---|---|---|
| X | US 2003/037157 A1 (PESTONI FLORIAN [US] ET AL) 20 February 2003 (2003-02-20)<br>paragraph [0020] - paragraph [0021]<br>paragraph [0034] - paragraph [0040]<br>paragraph [0046]<br>paragraph [0051]<br>paragraph [0058] - paragraph [0065]<br>paragraph [0074]<br>figures 4,5 | 1-18 |
| X | WO 2005/073856 A2 (KONINKL PHILIPS ELECTRONICS NV [NL]; PHILIPS CORP [US]; GUILLORIT FABI)<br>11 August 2005 (2005-08-11)<br>page 1, line 20 - page 2, line 6<br>page 2, line 15 - line 31<br>page 3, line 9 - page 6, line 21 | 1-18 |

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

* Special categories of cited documents :

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

| Date of the actual completion of the international search | Date of mailing of the international search report |
|---|---|
| 16 November 2006 | 24/11/2006 |

| Name and mailing address of the ISA/ | Authorized officer |
|---|---|
| European Patent Office, P.B. 5818 Patentlaan 2<br>NL - 2280 HV Rijswijk<br>Tel. (+31-70) 340-2040, Tx. 31 651 epo nl,<br>Fax: (+31-70) 340-3016 | Homan, Peter |

Form PCT/ISA/210 (second sheet) (April 2005)

**INTERNATIONAL SEARCH REPORT**

Information on patent family members

International application No
PCT/EP2006/065350

| Patent document cited in search report | Publication date | Patent family member(s) | Publication date |
|---|---|---|---|
| US 2003037157 A1 | 20-02-2003 | NONE | |
| WO 2005073856 A2 | 11-08-2005 | EP 1711895 A2 | 18-10-2006 |

Form PCT/ISA/210 (patent family annex) (April 2005)

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(81)指定国 AP(BW,GH,GM,KE,LS,MW,MZ,NA,SD,SL,SZ,TZ,UG,ZM,ZW),EA(AM,AZ,BY,KG,KZ,MD,RU,TJ,TM),EP(AT,BE,BG,CH,CY,CZ,DE,DK,EE,ES,FI,FR,GB,GR,HU,IE,IS,IT,LT,LU,LV,MC,NL,PL,PT,RO,SE,SI,SK,TR),OA(BF,BJ,CF,CG,CI,CM,GA,GN,GQ,GW,ML,MR,NE,SN,TD,TG),AE,AG,AL,AM,AT,AU,AZ,BA,BB,BG,BR,BW,BY,BZ,CA,CH,CN,CO,CR,CU,CZ,DE,DK,DM,DZ,EC,EE,EG,ES,FI,GB,GD,GE,GH,GM,HN,HR,HU,ID,IL,IN,IS,JP,KE,KG,KM,KN,KP,KR,KZ,LA,LC,LK,LR,LS,LT,LU,LV,LY,MA,MD,MG,MK,MN,MW,MX,MY,MZ,NA,NG,NI,NO,NZ,OM,PG,PH,PL,PT,RO,RS,RU,SC,SD,SE,SG,SK,SL,SM,SY,TJ,TM,TN,TR,TT,TZ,UA,UG,US,UZ,VC,VN,ZA,ZM,ZW

(特許庁注：以下のものは登録商標)
1．Ｂｌｕｅｔｏｏｔｈ

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Ｆターム(参考) 5K201 EB07 EC05 ED04 EF08

Espacenet

# Bibliographic data: JP2009538006 (A) — 2009-10-29

## MOBILE WIRELESS COMMUNICATION TERMINALS, SYSTEMS, METHODS, AND COMPUTER PROGRAM PRODUCTS FOR MANAGING PLAYBACK OF SONG FILES

**Inventor(s):**

**Applicant(s):**

**Classification:** **- international:** ***H04W4/06; H04W84/10; H04W84/12; H04W88/06***
**- cooperative:** **G10H1/0083**; **H04L67/04**; **H04L67/10**; G10H2210/301; G10H2220/081; G10H2240/131; G10H2240/231; G10H2240/251; H04W4/206; H04W76/023

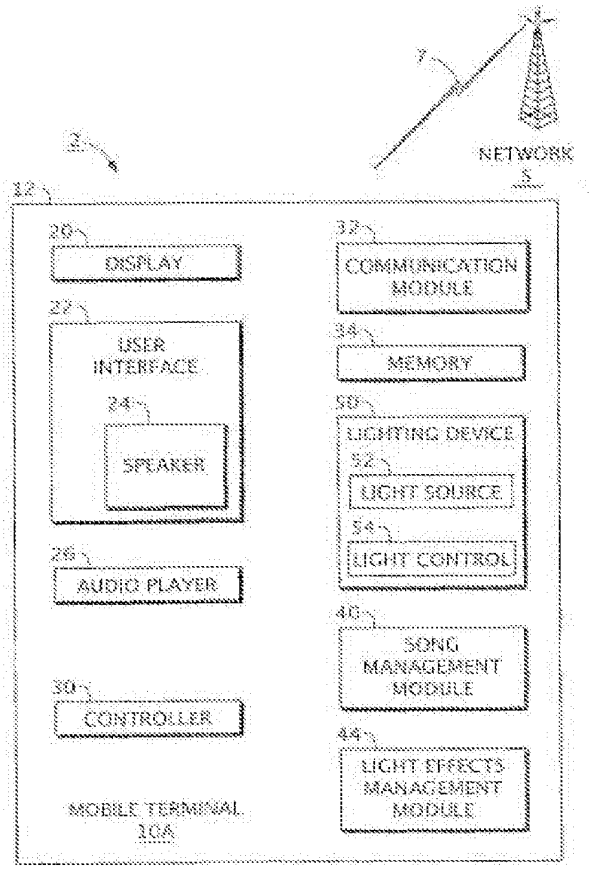
**Application number:** JP20090510289 20061030

**Priority number(s):** US20060435023 20060516 ; WO2006EP67942 20061030

**Also published as:** JP4860752 (B2) WO2007131555 (A1) US2008125172 (A1) US7546144 (B2) US2009215435 (A1) more

**Abstract not available for JP2009538006 (A)**
**Abstract of corresponding document: WO2007131555 (A1)**

A mobile wireless communication terminal includes a wireless communication module that is configured to communicate with other communication terminals over a wireless interface, and a controller. The controller is configured to establish a connection with at least one participant wireless communication terminal via the wireless communication module, to receive from the at least one participant wireless communication terminal an identification of a compliant song file stored on the at least one participant wireless communication terminal and having a metadata tag associated therewith indicating that the compliant song file is classified in a prescribed song file category, and to execute playback of the compliant song file.


NETWORK
5
2
12
20
DISPLAY
22
USER INTERFACE
24
SPEAKER
26
AUDIO PLAYER
30
CONTROLLER
MOBILE TERMINAL 10A
32
COMMUNICATION MODULE
34
MEMORY
50
LIGHTING DEVICE
52
LIGHT SOURCE
54
LIGHT CONTROL
40
SONG MANAGEMENT MODULE
44
LIGHT EFFECTS MANAGEMENT MODULE

(19)日本国特許庁(JP)　(12)公表特許公報(A)　(11)特許出願公表番号
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| H04W 84/10 | (2009.01) | H04Q | 7/00 | 629 | |
| H04W 88/06 | (2009.01) | H04Q | 7/00 | 653 | |
| H04W 4/06 | (2009.01) | H04Q | 7/00 | 126 | |

審査請求 有　予備審査請求 有　（全 39 頁）

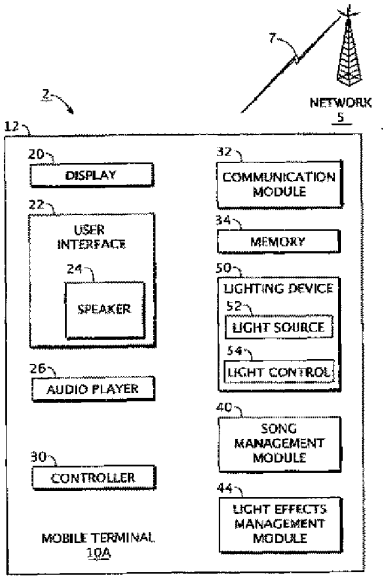
(21)出願番号　特願2009-510289 (P2009-510289)
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(33)優先権主張国　米国 (US)

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弁理士　木村　秀二

最終頁に続く

(54)【発明の名称】ソングファイルの再生を管理するための移動無線通信端末、システム、方法、及びコンピュータプログラム製品

(57)【要約】
移動無線通信端末が、無線インタフェースを介して別の通信端末と通信するように構成された無線通信モジュールと、コントローラとを含む。コントローラは、無線通信モジュールを通じて１以上の参加無線通信端末との接続を確立し、１以上の参加無線通信端末に格納された適合ソングファイルであって、適合ソングファイルが予め規定されたソングファイル・カテゴリに分類されることを示す、該適合ソングファイルと関連づけられたメタデータ・タグを有する適合ソングファイルの識別子を１以上の参加無線通信端末から受信し、適合ソングファイルの再生を実行するように構成される。



【特許請求の範囲】
【請求項1】
移動無線通信端末であって、
無線インタフェースを介して別の通信端末と通信するように構成された無線通信モジュールと、
コントローラであって、
前記無線通信モジュールを通じて１以上の参加無線通信端末との接続を確立し、
前記１以上の参加無線通信端末に格納された適合ソングファイルであって、該適合ソングファイルが予め定められたソングファイル・カテゴリに分類されていることを示す、前記適合ソングファイルと関連づけられたメタデータ・タグを有する前記適合ソングファイルの識別子を前記１以上の参加無線通信端末から受信し、
前記適合ソングファイルの再生を実行する
ように構成されたコントローラと、
を備えることを特徴とする移動無線通信端末。
【請求項2】
前記コントローラは、
前記無線通信モジュールを通じて複数の参加無線通信端末との接続を確立し、
該複数の参加無線通信端末のうちの２以上の参加無線通信端末から適合ソングの識別子を受信する
ように構成されることを特徴とする請求項１に記載の無線通信端末。
【請求項3】
前記コントローラは、
前記無線通信モジュールを通じて複数の参加無線通信端末との接続を確立し、
前記複数の参加無線通信端末において前記適合ソングファイルの再生を同時に実行するように構成されることを特徴とする請求項１又は２に記載の無線通信端末。
【請求項4】
前記コントローラは、前記適合ソングファイルを前記１以上の参加無線通信端末から再生用として検索するように構成されることを特徴とする請求項１乃至３のいずれか１項に記載の無線通信端末。
【請求項5】
前記無線通信モジュールは、ダイレクト・ポイント・ツー・ポイント無線インタフェースを介して別の通信端末と通信するように構成され、
前記コントローラは、
前記ダイレクト・ポイント・ツー・ポイント無線インタフェースを介して前記無線通信モジュールを通じて前記１以上の参加無線通信端末との接続を確立し、
前記ダイレクト・ポイント・ツー・ポイント無線インタフェースを介して前記１以上の参加無線通信端末から前記適合ソングファイルの識別子を受信する
ように構成される
ことを特徴とする請求項１乃至４のいずれか１項に記載の無線通信端末。
【請求項6】
前記無線通信モジュールはブルートゥース送信機を備えることを特徴とする請求項１乃至５のいずれか１項に記載の無線通信端末。
【請求項7】
前記無線通信端末はセルラ電話機を含むことを特徴とする請求項１乃至６のいずれか１項に記載の無線通信端末。
【請求項8】
移動無線通信端末であって、
無線インタフェースを介して別の通信端末と通信するように構成された無線通信モジュールと、

コントローラであって、
前記無線通信モジュールを通じて１以上の参加無線通信端末との接続を確立し、
ノミネートソングファイルのリストを保持し、
前記１以上の参加無線通信端末から１以上の得票メッセージを受信し、
選出されたソングファイルを前記１以上の得票メッセージに基づいて前記ノミネートソングファイルのリストから決定し、
前記選出されたソングファイルの再生を実行する
ように構成されたコントローラと、
を備えることを特徴とする移動無線通信端末。
【請求項9】
前記コントローラは、
ノミネートソングファイルの識別子を前記１以上の参加無線通信端末から受信し、
前記ノミネートソングファイルの前記識別子をノミネートソングファイルの前記リストに追加する
ように構成されることを特徴とする請求項８に記載の無線通信端末。
【請求項10】
前記コントローラは、
前記無線通信モジュールを通じて複数の参加無線通信端末との接続を確立し、
前記複数の参加無線通信端末のうちの２以上の参加無線通信端末から得票メッセージを受信する
ように構成されることを特徴とする請求項８又は９に記載の無線通信端末。
【請求項11】
前記コントローラは、
前記無線通信モジュールを通じて複数の参加無線通信端末との接続を確立し、
前記選出されたソングファイルの再生を前記複数の参加無線通信端末において同時に実行する
ように構成されることを特徴とする請求項８乃至１０のいずれか１項に記載の無線通信端末。
【請求項12】
前記コントローラは、前記選出されたソングファイルを前記１以上の参加無線通信端末から再生用として検索するように構成されることを特徴とする請求項８乃至１１のいずれか１項に記載の無線通信端末。
【請求項13】
前記無線通信モジュールは、ダイレクト・ポイント・ツー・ポイント無線インタフェースを介して別の通信端末と通信するように構成され、
前記コントローラは、
前記ダイレクト・ポイント・ツー・ポイント無線インタフェースを介して前記無線通信モジュールを通じて前記１以上の参加無線通信端末との接続を確立し、
前記ダイレクト・ポイント・ツー・ポイント無線インタフェースを介して前記１以上の参加無線通信端末から前記１以上の得票メッセージを受信する
ように構成される
ことを特徴とする請求項８乃至１２のいずれか１項に記載の無線通信端末。
【請求項14】
前記無線通信モジュールはブルートゥース送信機を備えることを特徴とする請求項８乃至１３のいずれか１項に記載の無線通信端末。
【請求項15】
前記無線通信端末はセルラ電話機を含むことを特徴とする請求項８乃至１４のいずれか１項に記載の無線通信端末。
【請求項16】
移動無線通信端末であって、

無線インタフェースを介して別の通信端末と通信するように構成された無線通信モジュールと、
コントローラであって、
前記無線通信モジュールを通じて１以上の参加無線通信端末との接続を確立し、
前記１以上の参加無線通信端末の１以上の照明装置をソングファイルの再生に対応して制御するように前記１以上の参加無線通信端末に命令する１以上の照明効果信号を、前記１以上の参加無線通信端末へ送信する
ように構成されるコントローラと、
を備えることを特徴とする移動無線通信端末。
【請求項17】
前記コントローラは、
前記無線通信モジュールを通じて複数の参加無線通信端末との接続を確立し、
前記複数の参加無線通信端末の各々に対して前記ソングファイルの再生に対応して該参加無線通信端末の照明装置を制御するように命令する照明効果信号を、前記複数の参加無線通信端末の各参加無線通信端末へ送信する
ように構成されることを特徴とする請求項１６に記載の無線通信端末。
【請求項18】
前記コントローラは、
前記複数の参加無線通信端末に対して該参加無線通信端末の前記照明装置を互いから別様に制御するように命令する照明効果信号を、前記複数の参加無線通信端末の各参加無線通信端末へ送信するように構成される
ことを特徴とする請求項１７に記載の無線通信端末。
【請求項19】
前記コントローラは、
前記複数の参加無線通信端末の各参加無線通信端末へ照明効果信号を送信して、前記複数の参加無線通信端末のうちの第１の参加無線通信端末のディスプレイから、前記複数の参加無線通信端末のうちの第２の参加無線通信端末のディスプレイへ時間の経過と共に動く画像を前記複数の参加無線通信端末に、該参加無線通信端末のそれぞれのディスプレイに表示させる
ように構成されることを特徴とする請求項１８に記載の無線通信端末。
【請求項20】
前記コントローラは、
前記複数の参加無線通信端末の各参加無線通信端末へ照明効果信号を送信して、前記複数の参加無線通信端末のうちの第１の参加無線通信端末の照明装置に第１のオーディオ周波数範囲内のオーディオ信号に応答させるとともに、前記複数の参加無線通信端末のうちの第２の参加無線通信端末の照明装置に、前記第１のオーディオ周波数範囲とは異なる第２のオーディオ周波数範囲内のオーディオ信号に応答させる
ように構成されることを特徴とする請求項１８又は１９に記載の無線通信端末。
【請求項21】
前記コントローラは、前記複数の参加無線通信端末において前記ソングファイルの再生を同時に実行するように構成されることを特徴とする請求項１７乃至２０のいずれか１項に記載の無線通信端末。
【請求項22】
前記無線通信モジュールは、ダイレクト・ポイント・ツー・ポイント無線インタフェースを介して別の通信端末と通信するように構成され、
前記コントローラは、
前記ダイレクト・ポイント・ツー・ポイント無線インタフェースを介して前記無線通信モジュールを通じて前記１以上の参加無線通信端末との接続を確立し、
前記ダイレクト・ポイント・ツー・ポイント無線インタフェースを介して前記１以上の照明効果信号を前記１以上の参加無線通信端末へ送信する

ように構成される
ことを特徴とする請求項１６乃至２１のいずれか１項に記載の無線通信端末。
【請求項23】
前記無線通信モジュールはブルートゥース送信機を備えることを特徴とする請求項１６乃至２２のいずれか１項に記載の無線通信端末。
【請求項24】
前記無線通信端末はセルラ電話機を含むことを特徴とする請求項１６乃至２３のいずれか１項に記載の無線通信端末。
【発明の詳細な説明】
【技術分野】
【0001】
本発明は、電子装置に関し、特に、ソングファイルを再生するための電子装置、方法、及びコンピュータプログラム製品に関する。
【背景技術】
【0002】
ソング（曲）ファイルを格納するための（セルラ電話機などの）無線通信端末のような移動電子装置が広範に使用されている。ユーザは、自分の移動電子装置に格納されているメディアセンタが利用可能な場合には、（ＰＣやラップトップ、テレビ、オーディオ受信機などの）メディアセンタのような別の装置又は別の無線通信端末でソングファイルの再生を望む場合がある。このソングファイルの再生は、相手方の装置が好適な通信モジュールを装備していれば、ケーブル又は（ブルートゥース接続など）無線リンクを介して相手方の装置と接続された電子装置により達成することができる。上記通信モジュールは、組込み型モジュールや補助（例えばプラグイン）モジュールであってもよい。１以上の移動電子装置から（単複の）再生装置へソングファイルを１つずつ送信することが可能である。
【図面の簡単な説明】
【0022】
【図1】本発明のいくつかの実施形態に係る移動無線通信端末及び例示の基地局トランシーバのブロック図である。
【図2】本発明のいくつかの実施形態に係る方法を例示するフローチャートである。
【図3】図１の移動無線通信端末を含む本発明のいくつかの実施形態に係るソングファイル再生システムを示すブロックである。
【図4】図１の移動無線通信端末を含む本発明の別の実施形態に係るソングファイル再生システムを示すブロック図である。
【図5】図１の移動無線通信端末を含む本発明の別の実施形態によるソングファイル再生システムを示すブロック図である。
【図6】本発明のいくつかの実施形態に係る図１の移動無線通信端末のディスプレイを示すブロック図である。
【図7】本発明の別の実施形態に従う方法を示すフローチャートである。
【図8】本発明の別の実施形態に従う方法を示すフローチャートである。
【図9】本発明の別の実施形態に従うソングファイル再生システムを示すブロック図である。
【図10A】システムの３つの移動無線通信端末に表示されたアニメーション・シーケンスを示す本発明の複数の実施形態によるシステムのブロック図である。
【図10B】システムの３つの移動無線通信端末に表示されたアニメーション・シーケンスを示す本発明の複数の実施形態によるシステムのブロック図である。
【図10C】システムの３つの移動無線通信端末に表示されたアニメーション・シーケンスを示す本発明の複数の実施形態によるシステムのブロック図である。

【図1】

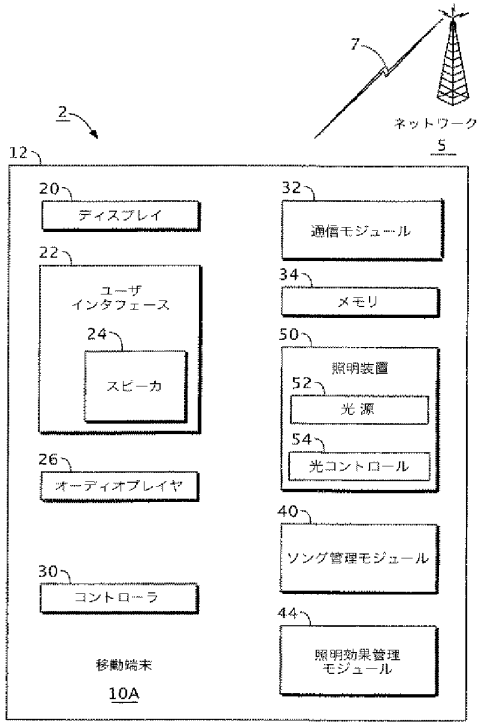

7
ネットワーク
5
2
12
20
ディスプレイ
22
ユーザ
インタフェース
24
スピーカ
26
オーディオプレイヤ
30
コントローラ
移動端末
10A
32
通信モジュール
34
メモリ
50
照明装置
52
光源
54
光コントロール
40
ソング管理モジュール
44
照明効果管理
モジュール

FIG. 1

【図2】

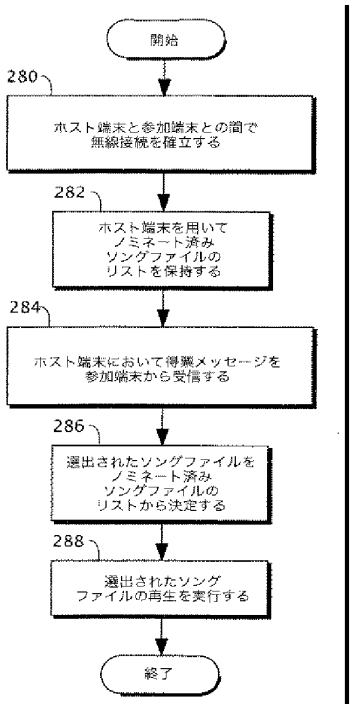

開始
280
ホスト端末と参加端末との間で
無線接続を確立する
282
ホスト端末を用いて
ノミネート済み
ソングファイルの
リストを保持する
284
ホスト端末において得票メッセージを
参加端末から受信する
286
選出されたソングファイルを
ノミネート済み
ソングファイルの
リストから決定する
288
選出されたソング
ファイルの再生を実行する
終了

FIG. 2

【図３】

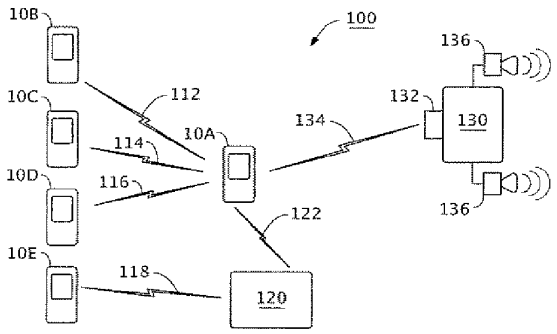

100
10B
10C
10D
10E
10A
112
114
116
118
120
122
130
132
134
136
136

FIG. 3

【図4】

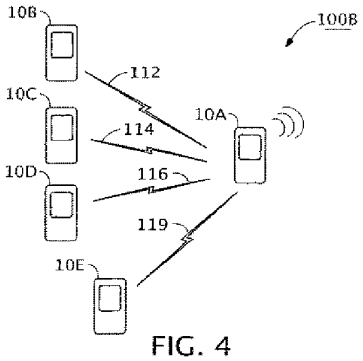



FIG. 4

【図5】

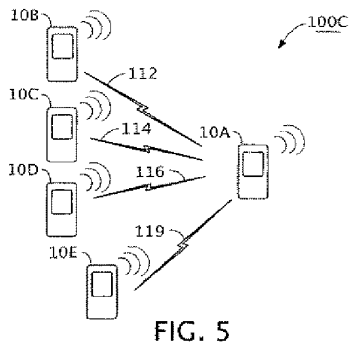



FIG. 5

【図6】

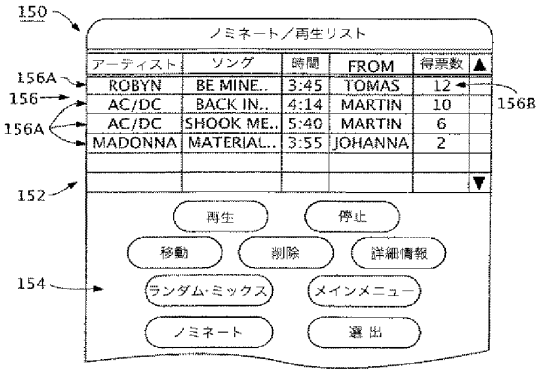

150
ノミネート／再生リスト
アーティスト
ソング
時間
FROM
得票数
156A
156
156A
156B
ROBYN
BE MINE..
3:45
TOMAS
12
AC/DC
BACK IN..
4:14
MARTIN
10
AC/DC
SHOOK ME..
5:40
MARTIN
6
MADONNA
MATERIAL..
3:55
JOHANNA
2
152
再生
停止
移動
削除
詳細情報
154
ランダム・ミックス
メインメニュー
ノミネート
選出

FIG. 6

【図7】

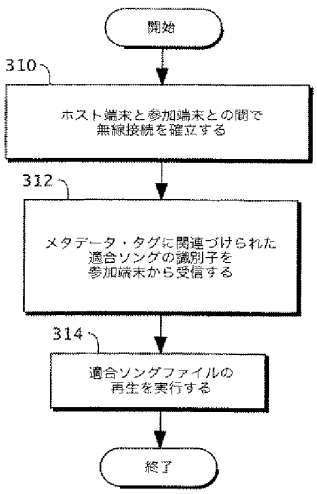

開始
310
ホスト端末と参加端末との間で
無線接続を確立する
312
メタデータ・タグに関連づけられた
適合ソングの識別子を
参加端末から受信する
314
適合ソングファイルの
再生を実行する
終了

FIG. 7

【図8】

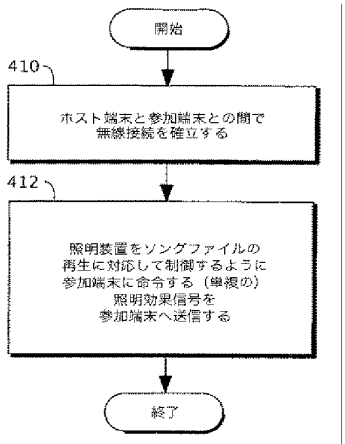

開始
410
ホスト端末と参加端末との間で
無線接続を確立する
412
照明装置をソングファイルの
再生に対応して制御するように
参加端末に命令する（単複の）
照明効果信号を
参加端末へ送信する
終了

FIG. 8

【図9】

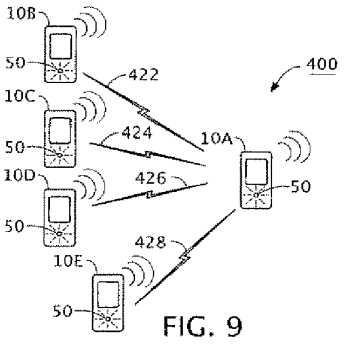



FIG. 9

【図10A】

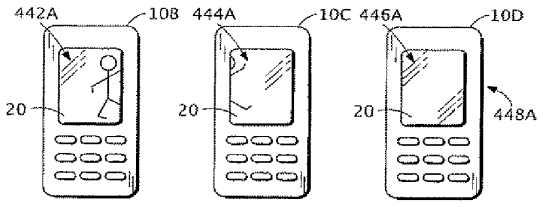



FIG. 10A

【図10B】

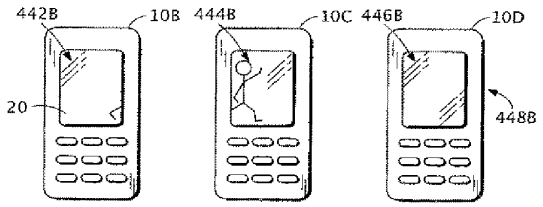



FIG. 10B

【図10C】

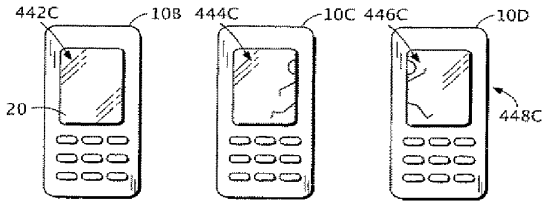



FIG. 10C

【手続補正書】
【提出日】平成20年3月14日(2008.3.14)
【手続補正1】
【補正対象書類名】特許請求の範囲
【補正対象項目名】全文
【補正方法】変更
【補正の内容】
【特許請求の範囲】
【請求項1】
移動無線通信端末であって、
無線インタフェースを介して別の通信端末と通信するように構成された無線通信モジュールと、
コントローラであって、
前記無線通信モジュールを通じて１以上の参加無線通信端末との接続を確立し、
前記１以上の参加無線通信端末に格納された適合ソングファイルであって、予め定められたソングファイル・カテゴリに分類されている前記適合ソングファイルを要求し、
前記１以上の参加無線通信端末に格納された適合ソングファイルであって、該適合ソングファイルが前記予め定められたソングファイル・カテゴリに分類されていることを示す、前記適合ソングファイルと関連づけられたメタデータ・タグを有する前記適合ソングファイルの識別子を前記１以上の参加無線通信端末から受信し、
前記適合ソングファイルの再生を実行する
ように構成されたコントローラと、
を備えることを特徴とする移動無線通信端末。
【請求項2】
前記コントローラは、
前記無線通信モジュールを通じて複数の参加無線通信端末との接続を確立し、
該複数の参加無線通信端末のうちの２以上の参加無線通信端末から適合ソングの識別子を受信する
ように構成されることを特徴とする請求項１に記載の無線通信端末。
【請求項3】
前記コントローラは、
前記無線通信モジュールを通じて複数の参加無線通信端末との接続を確立し、
前記複数の参加無線通信端末において前記適合ソングファイルの再生を同時に実行するように構成されることを特徴とする請求項１又は２に記載の無線通信端末。
【請求項4】
前記コントローラは、前記適合ソングファイルを前記１以上の参加無線通信端末から再生用として検索するように構成されることを特徴とする請求項１乃至３のいずれか１項に記載の無線通信端末。
【請求項5】
前記無線通信モジュールは、ダイレクト・ポイント・ツー・ポイント無線インタフェースを介して別の通信端末と通信するように構成され、
前記コントローラは、
前記ダイレクト・ポイント・ツー・ポイント無線インタフェースを介して前記無線通信モジュールを通じて前記１以上の参加無線通信端末との接続を確立し、
前記ダイレクト・ポイント・ツー・ポイント無線インタフェースを介して前記１以上の参加無線通信端末から前記適合ソングファイルの識別子を受信する
ように構成される
ことを特徴とする請求項１乃至４のいずれか１項に記載の無線通信端末。
【請求項6】
前記無線通信モジュールはブルートゥース送信機を備えることを特徴とする請求項１乃

至５のいずれか１項に記載の無線通信端末。
【請求項7】
前記無線通信端末はセルラ電話機を含むことを特徴とする請求項１乃至６のいずれか１項に記載の無線通信端末。
【請求項8】
移動無線通信端末であって、
無線インタフェースを介して別の通信端末と通信するように構成された無線通信モジュールと、
コントローラであって、
前記無線通信モジュールを通じて１以上の参加無線通信端末との接続を確立し、
ノミネートソングファイルのリストを保持し、
前記１以上の参加無線通信端末から１以上の得票メッセージを受信し、
選出されたソングファイルを前記１以上の得票メッセージに基づいて前記ノミネートソングファイルのリストから決定し、
前記選出されたソングファイルの再生を実行する
ように構成されたコントローラと、
を備えることを特徴とする移動無線通信端末。
【請求項9】
前記コントローラは、
ノミネートソングファイルの識別子を前記１以上の参加無線通信端末から受信し、
前記ノミネートソングファイルの前記識別子をノミネートソングファイルの前記リストに追加する
ように構成されることを特徴とする請求項８に記載の無線通信端末。
【請求項10】
前記コントローラは、
前記無線通信モジュールを通じて複数の参加無線通信端末との接続を確立し、
前記複数の参加無線通信端末のうちの２以上の参加無線通信端末から得票メッセージを受信する
ように構成されることを特徴とする請求項８又は９に記載の無線通信端末。
【請求項11】
前記コントローラは、
前記無線通信モジュールを通じて複数の参加無線通信端末との接続を確立し、
前記選出されたソングファイルの再生を前記複数の参加無線通信端末において同時に実行する
ように構成されることを特徴とする請求項８乃至１０のいずれか１項に記載の無線通信端末。
【請求項12】
前記コントローラは、前記選出されたソングファイルを前記１以上の参加無線通信端末から再生用として検索するように構成されることを特徴とする請求項８乃至１１のいずれか１項に記載の無線通信端末。
【請求項13】
前記無線通信モジュールは、ダイレクト・ポイント・ツー・ポイント無線インタフェースを介して別の通信端末と通信するように構成され、
前記コントローラは、
前記ダイレクト・ポイント・ツー・ポイント無線インタフェースを介して前記無線通信モジュールを通じて前記１以上の参加無線通信端末との接続を確立し、
前記ダイレクト・ポイント・ツー・ポイント無線インタフェースを介して前記１以上の参加無線通信端末から前記１以上の得票メッセージを受信する
ように構成される
ことを特徴とする請求項８乃至１２のいずれか１項に記載の無線通信端末。

【請求項14】
前記無線通信モジュールはブルートゥース送信機を備えることを特徴とする請求項８乃至１３のいずれか１項に記載の無線通信端末。
【請求項15】
前記無線通信端末はセルラ電話機を含むことを特徴とする請求項８乃至１４のいずれか１項に記載の無線通信端末。
【請求項16】
移動無線通信端末であって、
無線インタフェースを介して別の通信端末と通信するように構成された無線通信モジュールと、
コントローラであって、
前記無線通信モジュールを通じて複数の参加無線通信端末との接続を確立し、
前記複数の参加無線通信端末の各々の照明装置をソングファイルの再生に対応して制御するように前記複数の参加無線通信端末の各々に命令する照明効果信号を、前記複数の参加無線通信端末の各々へ送信する
ように構成されるコントローラと、
を備え、
前記コントローラは、
前記複数の参加無線通信端末に対して該参加無線通信端末の前記照明装置を互いから別様に制御するように命令する照明効果信号を、前記複数の参加無線通信端末の各参加無線通信端末へ送信するように構成される
ことを特徴とする移動無線通信端末。
【請求項17】
前記コントローラは、
前記複数の参加無線通信端末の各参加無線通信端末へ照明効果信号を送信して、前記複数の参加無線通信端末のうちの第１の参加無線通信端末のディスプレイから、前記複数の参加無線通信端末のうちの第２の参加無線通信端末のディスプレイへ時間の経過と共に動く画像を前記複数の参加無線通信端末に、該参加無線通信端末のそれぞれのディスプレイに表示させる
ように構成されることを特徴とする請求項１６に記載の無線通信端末。
【請求項18】
前記コントローラは、
前記複数の参加無線通信端末の各参加無線通信端末へ照明効果信号を送信して、前記複数の参加無線通信端末のうちの第１の参加無線通信端末の照明装置に第１のオーディオ周波数範囲内のオーディオ信号に応答させるとともに、前記複数の参加無線通信端末のうちの第２の参加無線通信端末の照明装置に、前記第１のオーディオ周波数範囲とは異なる第２のオーディオ周波数範囲内のオーディオ信号に応答させる
ように構成されることを特徴とする請求項１６又は１７に記載の無線通信端末。
【請求項19】
前記コントローラは、前記複数の参加無線通信端末において前記ソングファイルの再生を同時に実行するように構成されることを特徴とする請求項１６乃至１８のいずれか１項に記載の無線通信端末。
【請求項20】
前記無線通信モジュールは、ダイレクト・ポイント・ツー・ポイント無線インタフェースを介して別の通信端末と通信するように構成され、
前記コントローラは、
前記ダイレクト・ポイント・ツー・ポイント無線インタフェースを介して前記無線通信モジュールを通じて前記１以上の参加無線通信端末との接続を確立し、
前記ダイレクト・ポイント・ツー・ポイント無線インタフェースを介して前記１以上の照明効果信号を前記１以上の参加無線通信端末へ送信する

ように構成される
ことを特徴とする請求項１６乃至１９のいずれか１項に記載の無線通信端末。
【請求項21】
前記無線通信モジュールはブルートゥース送信機を備えることを特徴とする請求項１６乃至２０のいずれか１項に記載の無線通信端末。
【請求項22】
前記無線通信端末はセルラ電話機を含むことを特徴とする請求項１６乃至２１のいずれか１項に記載の無線通信端末。
【手続補正書】
【提出日】平成21年1月15日(2009.1.15)
【手続補正1】
【補正対象書類名】特許請求の範囲
【補正対象項目名】全文
【補正方法】変更
【補正の内容】
【特許請求の範囲】
【請求項1】
移動無線通信端末であって、
無線インタフェースを介して別の通信端末と通信するように構成された無線通信モジュールと、
コントローラであって、
前記無線通信モジュールを通じて１以上の参加無線通信端末との接続を確立し、
ノミネートソングファイルのリストを保持し、
前記１以上の参加無線通信端末から１以上の得票メッセージを受信し、
選出されたソングファイルを前記１以上の得票メッセージに基づいて前記ノミネートソングファイルのリストから決定し、
前記選出されたソングファイルの再生を実行する
ように構成されたコントローラと、
を備え、
前記コントローラは、
前記無線通信モジュールを通じて複数の参加無線通信端末との接続を確立し、
前記選出されたソングファイルの再生を前記複数の参加無線通信端末において同時に実行する
ように構成される
ことを特徴とする移動無線通信端末。
【請求項2】
前記コントローラは、
ノミネートソングファイルの識別子を前記１以上の参加無線通信端末から受信し、
前記ノミネートソングファイルの前記識別子をノミネートソングファイルの前記リストに追加する
ように構成されることを特徴とする請求項１に記載の無線通信端末。
【請求項3】
前記コントローラは、
前記無線通信モジュールを通じて複数の参加無線通信端末との接続を確立し、
前記複数の参加無線通信端末のうちの２以上の参加無線通信端末から得票メッセージを受信する
ように構成されることを特徴とする請求項１又は２に記載の無線通信端末。
【請求項4】
前記コントローラは、前記選出されたソングファイルを前記１以上の参加無線通信端末から再生用として検索するように構成されることを特徴とする請求項１乃至３のいずれか

１項に記載の無線通信端末。
【請求項5】
前記無線通信モジュールは、ダイレクト・ポイント・ツー・ポイント無線インタフェースを介して別の通信端末と通信するように構成され、
前記コントローラは、
前記ダイレクト・ポイント・ツー・ポイント無線インタフェースを介して前記無線通信モジュールを通じて前記１以上の参加無線通信端末との接続を確立し、
前記ダイレクト・ポイント・ツー・ポイント無線インタフェースを介して前記１以上の参加無線通信端末から前記１以上の得票メッセージを受信する
ように構成される
ことを特徴とする請求項１乃至４のいずれか１項に記載の無線通信端末。
【請求項6】
前記無線通信モジュールはブルートゥース送信機を備えることを特徴とする請求項１乃至５のいずれか１項に記載の無線通信端末。
【請求項7】
前記無線通信端末はセルラ電話機を含むことを特徴とする請求項１乃至６のいずれか１項に記載の無線通信端末。
【請求項8】
移動無線通信端末であって、
無線インタフェースを介して別の通信端末と通信するように構成された無線通信モジュールと、
コントローラであって、
前記無線通信モジュールを通じて複数の参加無線通信端末との接続を確立し、
前記複数の参加無線通信端末の各々の照明装置をソングファイルの再生に対応して制御するように前記複数の参加無線通信端末の各々に命令する照明効果信号を、前記複数の参加無線通信端末の各々へ送信する
ように構成されるコントローラと、
を備え、
前記コントローラは、
前記複数の参加無線通信端末に対して該参加無線通信端末の前記照明装置を互いから別様に制御するように命令する照明効果信号を、前記複数の参加無線通信端末の各参加無線通信端末へ送信するように構成される
ことを特徴とする移動無線通信端末。
【請求項9】
前記コントローラは、
前記複数の参加無線通信端末の各参加無線通信端末へ照明効果信号を送信して、前記複数の参加無線通信端末のうちの第１の参加無線通信端末のディスプレイから、前記複数の参加無線通信端末のうちの第２の参加無線通信端末のディスプレイへ時間の経過と共に動く画像を前記複数の参加無線通信端末に、該参加無線通信端末のそれぞれのディスプレイに表示させる
ように構成されることを特徴とする請求項８に記載の無線通信端末。
【請求項10】
前記コントローラは、
前記複数の参加無線通信端末の各参加無線通信端末へ照明効果信号を送信して、前記複数の参加無線通信端末のうちの第１の参加無線通信端末の照明装置に第１のオーディオ周波数範囲内のオーディオ信号に応答させるとともに、前記複数の参加無線通信端末のうちの第２の参加無線通信端末の照明装置に、前記第１のオーディオ周波数範囲とは異なる第２のオーディオ周波数範囲内のオーディオ信号に応答させる
ように構成されることを特徴とする請求項８又は９に記載の無線通信端末。
【請求項11】

前記コントローラは、前記複数の参加無線通信端末において前記ソングファイルの再生を同時に実行するように構成されることを特徴とする請求項８乃至１０のいずれか１項に記載の無線通信端末。

【請求項12】

前記無線通信モジュールは、ダイレクト・ポイント・ツー・ポイント無線インタフェースを介して別の通信端末と通信するように構成され、

前記コントローラは、

前記ダイレクト・ポイント・ツー・ポイント無線インタフェースを介して前記無線通信モジュールを通じて前記１以上の参加無線通信端末との接続を確立し、

前記ダイレクト・ポイント・ツー・ポイント無線インタフェースを介して前記１以上の照明効果信号を前記１以上の参加無線通信端末へ送信する

ように構成される

ことを特徴とする請求項８乃至１１のいずれか１項に記載の無線通信端末。

【請求項13】

前記無線通信モジュールはブルートゥース送信機を備えることを特徴とする請求項８乃至１２のいずれか１項に記載の無線通信端末。

【請求項14】

前記無線通信端末はセルラ電話機を含むことを特徴とする請求項８乃至１３のいずれか１項に記載の無線通信端末。

【国際調査報告】

【図10C】

## INTERNATIONAL SEARCH REPORT

International application No
PCT/EP2006/067942

A. CLASSIFICATION OF SUBJECT MATTER
INV. H04L29/06 H04L12/28

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)
H04L

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

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)
EPO-Internal, WPI Data, INSPEC

C. DOCUMENTS CONSIDERED TO BE RELEVANT

| Category* | Citation of document, with indication, where appropriate, of the relevant passages | Relevant to claim No. |
|---|---|---|
| X | WO 2004/075169 A2 (KONINKL PHILIPS ELECTRONICS NV [NL]; PHILIPS CORP [US]; VAN DE SLUIS B)<br>2 September 2004 (2004-09-02)<br>abstract<br>page 1, line 14 - line 30 | 1,2,4-7 |
| Y | page 11, line 21 - line 27<br>page 16, line 13 - line 26<br>page 21, line 8 - page 22, line 11 | 3 |
| Y | US 2002/168938 A1 (CHANG CHIN-CHI [TW])<br>14 November 2002 (2002-11-14)<br>abstract<br>page 1, paragraphs 9,10<br>page 2, paragraph 24 | 3,11 |

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[X] Further documents are listed in the continuation of Box C. [X] See patent family annex.

* Special categories of cited documents:

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

| Date of the actual completion of the international search | Date of mailing of the international search report |
|---|---|
| 20 April 2007 | 26/04/2007 |

| Name and mailing address of the ISA/ | Authorized officer |
|---|---|
| European Patent Office, P.B. 5818 Patentlaan 2<br>NL - 2280 HV Rijswijk<br>Tel. (+31-70) 340-2040, Tx. 31 651 epo nl,<br>Fax: (+31-70) 340-3016 | BLANCO CARDONA, P |

Form PCT/ISA/210 (second sheet) (April 2005)

**INTERNATIONAL SEARCH REPORT**

International application No
PCT/EP2006/067942

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

| Category* | Citation of document, with indication, where appropriate, of the relevant passages | Relevant to claim No. |
|---|---|---|
| X | US 2003/032419 A1 (SHIBASAKI HIROAKI [JP] ET AL) 13 February 2003 (2003-02-13)<br>abstract<br>page 9, paragraphs 138,139<br>page 10, paragraphs 145,149<br>page 11, paragraphs 158,159 | 1 |
| X<br>Y | US 2003/037157 A1 (PESTONI FLORIAN [US] ET AL) 20 February 2003 (2003-02-20)<br>abstract<br>page 1, paragraphs 3,4,11<br>page 2, paragraphs 21,35,36<br>page 4, paragraphs 51,59<br>page 5, paragraphs 67,68<br>page 6, paragraphs 78,80,85,87 | 8-10,<br>12-15<br>11 |
| X<br>A | US 2005/160270 A1 (GOLDBERG DAVID [US] ET AL) 21 July 2005 (2005-07-21)<br>abstract<br>page 2, paragraph 18<br>page 3, paragraph 33<br>page 12, paragraph 172<br>page 29, paragraph 330-333<br>page 30, paragraph 340<br>page 34, paragraphs 377,378 | 16-18,<br>20-24<br>19 |

Form PCT/ISA/210 (continuation of second sheet) (April 2005)

**INTERNATIONAL SEARCH REPORT**

International application No.
PCT/EP2006/067942

**Box II Observations where certain claims were found unsearchable (Continuation of item 2 of first sheet)**

This International Search 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.:
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

**Box III Observations where unity of invention is lacking (Continuation of item 3 of first sheet)**

This International Searching Authority found multiple inventions in this international application, as follows:

see additional sheet

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 (2)) (January 2004)

International Application No. PCT/EP2006 /067942

FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

This International Searching Authority found multiple (groups of) inventions in this international application, as follows:

1. claims: 1-7

Mobile terminal executing playback of a song file simultaneously on a plurality of wireless terminals

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2. claims: 8-15

Mobile terminal receiving vote messages for nominated song files

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3. claims: 16-24

Mobile terminal sending a signal to other wireless terminals instructing to control a lighting device in correspondence with the playback of a song file

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**INTERNATIONAL SEARCH REPORT**

Information on patent family members

International application No
PCT/EP2006/067942

| Patent document cited in search report | Publication date | Patent family member(s) | Publication date |
|---|---|---|---|
| WO 2004075169 A2 | 02-09-2004 | EP 1597895 A2<br>JP 2006518507 T<br>KR 20050104382 A | 23-11-2005<br>10-08-2006<br>02-11-2005 |
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| US 2003037157 A1 | 20-02-2003 | NONE | |
| US 2005160270 A1 | 21-07-2005 | NONE | |

Form PCT/ISA/210 (patent family annex) (April 2005)

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（特許庁注：以下のものは登録商標）
１．ＧＳＭ

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Ｆターム(参考) 5K067 AA34　BB04　BB21　DD51　EE04　EE16　HH21

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## SOUND OUTPUT DEVICE AND METHOD


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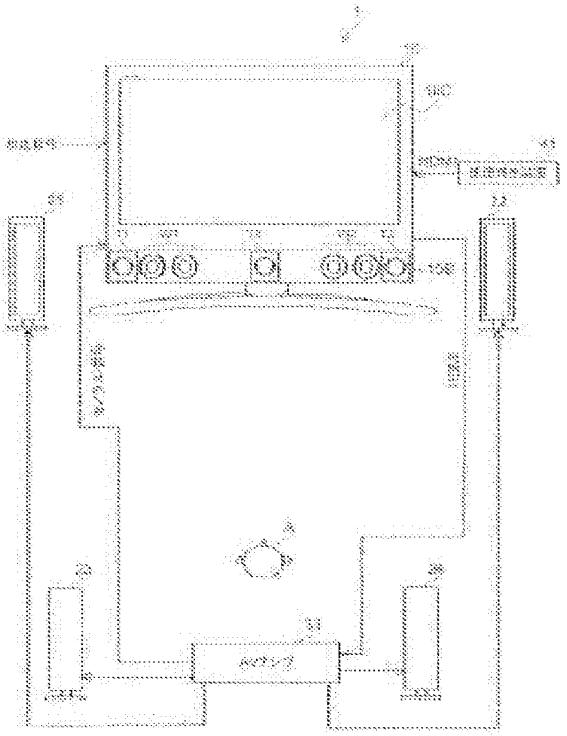
**Classification:** **- international:** ***H04S5/02***
**- cooperative:**

**Application number:** JP20110035874 20110222

**Priority number(s):** JP20110035874 20110222


### Abstract of JP2011130496 (A)


PROBLEM TO BE SOLVED: To provide a sound output device and method, capable of being used as a center speaker upon usage of an external speaker. ;SOLUTION: The sound output device has a first to third speakers disposed in a housing. The first and second speakers are disposed in the right and left of the housing so that the third speaker is interposed therebetween, respectively, and include a speaker which outputs low-tone components of sound signals. The third speaker includes a speaker which outputs high-tone components of sound signals. ;COPYRIGHT: (C)2011,JPO&INPIT

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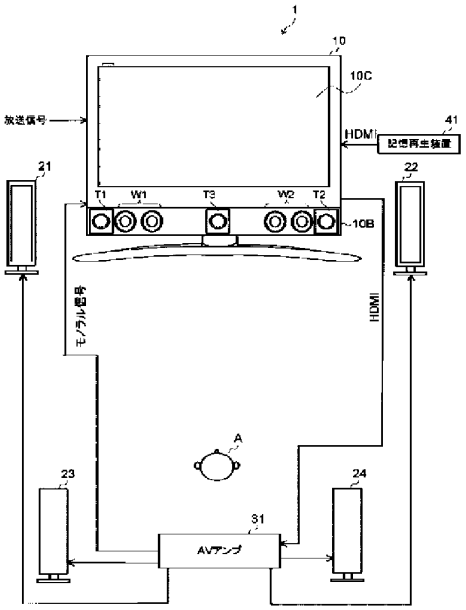
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Ｆターム(参考)　5D062 BB10

(54)【発明の名称】音声出力装置、音声出力方法

(57)【要約】
【課題】外部スピーカを使用する際に、センタースピーカとして使用できる音声出力装置および音声出力方法を提供する。
【解決手段】本発明の一態様に係る音声出力装置は、筐体内に配置された第１ないし第３のスピーカを備え、第１，第２のスピーカは、第３のスピーカを挟んで筐体の左右に夫々配置され、音声信号の低音域成分を出力するスピーカを含み、第３のスピーカは、音声信号の高音域成分を出力するスピーカを含む。
【選択図】図１



【特許請求の範囲】
【請求項１】
筐体内に配置された第１ないし第３のスピーカを備え、
前記第１，第２のスピーカは、前記第３のスピーカを挟んで前記筐体の左右に夫々配置され、音声信号の低音域成分を出力するスピーカを含み、
前記第３のスピーカは、音声信号の高音域成分を出力するスピーカを含むことを特徴とする音声出力装置。
【請求項２】
外部スピーカの使用状態を検知する検知信号に基づいて、前記第１、第２のスピーカからステレオ音声信号を出力する第１の態様と、前記第３のスピーカからモノラル音声信号を出力する第２の態様とを切換えることを特徴とする請求項１に記載の音声出力装置。
【請求項３】
前記第２の態様を使用するか否かを設定する設定部をさらに具備し、
前記設定部での設定に基づいて、前記第１の態様と前記第２の態様とを切換えることを特徴とする請求項２に記載の音声出力装置。
【請求項４】
前記第２の態様は、前記第３のスピーカからモノラル音声信号のうち高音域成分を出力し、前記第１，第２のスピーカからモノラル音声信号のうち低音域成分を出力することを特徴とする請求項２または請求項３に記載の音声出力装置。
【請求項５】
前記ステレオ音声信号または前記モノラル音声信号を選択する選択部と、
前記モノラル音声信号をミュートする第１のミュート部と、
前記ステレオ音声信号をミュートする第２のミュート部と、
前記外部スピーカを使用している場合、前記選択部に前記モノラル音声信号を選択させると共に、前記第２のミュート部へ前記ステレオ音声信号をミュートさせ、前記外部スピーカを使用していない場合、前記選択部に前記ステレオ音声信号を選択させると共に前記第１のミュート部へ前記モノラル音声信号をミュートさせる制御部と、
をさらに具備することを特徴とする請求項２に記載の音声出力装置。
【請求項６】
前記第１のミュート部の後段に設けられ、前記モノラル音声信号のうち高音域成分を通過させる第１のフィルタと、
前記第２のミュート部の後段に設けられ、前記ステレオ音声信号のうち高音域成分を通過させる第２のフィルタと、
前記選択部の後段に設けられ、前記選択部により選択されたステレオ音声信号または前記モノラル音声信号のうち低音域成分を通過させる第３のフィルタと、
をさらに具備することを特徴とする請求項５に記載の音声出力装置。
【請求項７】
第３のスピーカを挟んで筐体の左右に設けられた第１，第２のスピーカから音声信号の低音域成分を出力し、前記第３のスピーカから音声信号の高音域成分を出力することを特徴とする音声出力方法。
【発明の詳細な説明】
【技術分野】
【０００１】
本発明は、センタースピーカとして使用できる音声出力装置および音声出力方法に関する。
【背景技術】
【０００２】
従来の音声出力装置には、音響の臨場感を高めるため複数のスピーカを利用して音声を再生するもの（特許文献１）がある。この音声出力装置では、ユーザの前方正面、前方左右および後方左右にスピーカをそれぞれ配置する（５チャンネル）。加えて、低音を強化

するサブウーファーを置く（０．１ｃｈ）。上記６つのスピーカ（５．１ｃｈ）を視聴者の周りに配置して音声を出力することで、立体感のある音を得ることができ臨場感が増す。

【先行技術文献】
【特許文献】
【０００３】
【特許文献１】特表２００３－５１８３４５号公報
【発明の概要】
【発明が解決しようとする課題】
【０００４】
しかしながら、この５．１ｃｈの音声出力装置をＴＶ等のＡＶ機器と組み合わせて使用する場合、ＡＶ機器が具備しているスピーカとの位置関係が問題となる。特に、ユーザの前方正面に配置されるスピーカ（センタースピーカ）は、音声の定位を考慮してユーザの正面のＴＶ等の映像表示装置の近くに配置する必要がある。しかし、ＴＶ等のＡＶ機器に具備されたスピーカがその機器の下側に配されている場合など、ＡＶ機器のスピーカの開口部をセンタースピーカが遮る配置となる問題がある。また、センタースピーカをユーザの正面に配置しない場合、音声の定位位置が変わるため特にセンターの定位感が十分に得られない可能性があるなど、ＡＶ機器が具備しているスピーカとの共存性に問題が生じる。

【０００５】
本発明は、かかる従来の問題を解消すべくなされたもので、例えば、５．１ｃｈの音声出力装置で使用される外部スピーカを用いる際に、通常のステレオ用のスピーカとしてだけではなくセンタースピーカとしても使用できる音声出力装置および音声出力方法を提供することを目的とする。
【課題を解決するための手段】
【０００６】
本発明の一態様に係る音声出力装置は、筐体内に配置された第１ないし第３のスピーカを備え、第１，第２のスピーカは、第３のスピーカを挟んで筐体の左右に夫々配置され、音声信号の低音域成分を出力するスピーカを含み、第３のスピーカは、音声信号の高音域成分を出力するスピーカを含む。
【０００７】
本発明の一態様に係る音声出力方法は、第３のスピーカを挟んで筐体の左右に設けられた第１，第２のスピーカから音声信号の低音域成分を出力し、第３のスピーカから音声信号の高音域成分を出力する。
【発明の効果】
【０００８】
本発明によれば、ステレオ用スピーカあるいはセンタースピーカとしても使用できる音声出力装置および音声出力方法を提供できる。
【図面の簡単な説明】
【０００９】
【図１】第１の実施形態に係る音響システムの構成の一例を示す図である。
【図２】ＳＴＢの概要を示す図である。
【図３】第１の実施形態に係る音声信号の処理系統の構成を示す図である。
【図４】第１の実施形態に係る音声出力装置の動作を示すフローチャートである。
【図５】比較例に係る音声信号の処理系統の構成を示す図である。
【図６Ａ】比較例に係るトランジェント特性を示す図である。
【図６Ｂ】比較例に係るトランジェント特性を示す図である。
【図６Ｃ】比較例に係るトランジェント特性を示す図である。
【図７Ａ】第１の実施形態に係るトランジェント特性を示す図である。
【図７Ｂ】第１の実施形態に係るトランジェント特性を示す図である。

【図７Ｃ】第１の実施形態に係るトランジェント特性を示す図である。
【発明を実施するための形態】
【００１０】
以下、図面を参照して、本発明の実施形態を詳細に説明する。
（第１の実施形態）
図１は、第１の実施形態に係る音響システム１の構成を示す図である。第１の実施形態に係る音響システム１は、音声出力装置１０、スピーカ２１から２４、ＡＶアンプ３１、記憶再生装置４１を具備する。
【００１１】
音声出力装置１０は、ＳＴＢ（Set top box）１０Ａ（図示せず）、スピーカ部１０Ｂ、表示部１０Ｃから構成される。ＳＴＢ１０Ａは、図示しないアンテナから入力される放送局等の放送信号をデコードして映像信号および音声信号を生成する。ＳＴＢ１０Ａは、生成した映像信号および音声信号、もしくは外部の記憶再生装置（または再生装置）４１から入力される映像信号、音声信号をスピーカ部１０Ｂ、表示部１０Ｃへそれぞれ入力する。また、ＳＴＢ１０Ａは、音声信号をＡＶアンプ３１へ入力する。表示部１０Ｃは、ＳＴＢ１０Ａから入力される映像信号に基づいて映像を表示する。
【００１２】
スピーカ部１０Ｂは、ＳＴＢ１０Ａ、もしくはＡＶアンプ３１から入力される音声信号に基づいて音声を出力する。スピーカ部１０Ｂは、ステレオ音声再生用のウーハー（Woofer）Ｗ１、Ｗ２とツィータ（Tweeter）Ｔ１、Ｔ２を具備する２ウェイスピーカである。ウーハーＷ１とツィータＴ１、およびウーハーＷ２とツィータＴ２は、一体的に形成されたスピーカボックスの左側および右側にそれぞれ配置される。また、ウーハーＷ１とウーハーＷ２との間には、ツィータＴ３が配置される。ツィータＴ３は、ウーハーＷ１、Ｗ２と共にセンタースピーカとして機能する。ツィータＴ３は、センタースピーカ用の音声信号（センターチャンネル）の高音域、ウーハーＷ１、Ｗ２は、センターチャンネルの低音域を各々受け持つ。なお、ウーハーＷ１、Ｗ２は、フルレンジスピーカであってもよい。
【００１３】
スピーカ２１から２４は、ユーザＡの周りを取り囲むように、ユーザの前方左右および後方左右に配置される。スピーカ２１から２４は、音声出力装置１０のスピーカ部１０Ｂが具備するスピーカ（ツィータＴ３、ウーハーＷ１、Ｗ２）と共に、５．１ｃｈの音響システムを構成する。
【００１４】
ＡＶアンプ３１は、ＨＤＭＩ（High-definition multimedia interface）及び／もしくは光またはコアキシャル方式による音声デジタル伝送（ＳＰＤＩＦ）により音声出力装置１０と接続される。ＨＤＭＩでは、非圧縮でデジタル映像信号、デジタル音声信号が伝送される。ＡＶアンプ３１は、音声出力装置１０から入力される音声信号を増幅し、スピーカ２１から２４へ入力する。
【００１５】
なお、ＡＶアンプ３１には、センタースピーカ用の出力が２種類用意されている。一つは、ボリュームコントロール（音量制御）されたライン出力である。他の一つは、先のボリュームコントロールされたライン出力をさらに増幅した出力である。この第１の実施形態では、ボリュームコントロールされたライン出力が音声出力装置１０へ入力され、センタースピーカとして機能するスピーカ部１０Ｂから音声として出力される。
【００１６】
記憶再生装置４１は、コンテンツを記憶・再生するＤＶＤ（Digital versatile disk）プレーヤまたはＤＶＤレコーダやＨＤＤ（Hard disk drive）レコーダ等である。記憶再生装置４１は、ＨＤＭＩにより音声出力装置１０と接続される。記憶再生装置４１は、再生するコンテンツ（例えば、映画やＰＶ（Promotion video）等）の映像信号、音声信号、制御信号を音声出力装置１０へ入力する。ＨＤＭＩでは、映像信号用、音声信号用、制御信号用のケーブルが一体化しているため配線を簡略化できる。

【００１７】
図２は、第１の実施形態で使用する機器の電子回路（ＳＴＢ１０Ａ）の概略構成を示す図である。ＳＴＢ１０Ａは、選局部１０１、端子１０２、Ｉ／Ｆ１０３、端子１０４、Ｉ／Ｆ１０５、分離部１０６、デコード部１０７、音声信号処理部１０８、増幅部１０９、端子１１０、リモコン受信部１１１を具備する。
【００１８】
選局部１０１は、アンテナで受信された放送信号から所望のチャンネルを選局する。選局部１０１は、選局した放送信号を復調してＴＳ（Transport stream）を生成する。
【００１９】
端子１０２は、記憶再生装置４１を接続するＨＤＭＩ端子である。Ｉ／Ｆ（Inter face）１０３は、端子１０２に接続された記憶再生装置４１との間でデータの送受信を行うためのインターフェースである。
【００２０】
端子１０４は、ＡＶアンプ３１を接続するＨＤＭＩ端子もしくはＳＰＤＩＦ端子である。Ｉ／Ｆ１０５は、端子１０４に接続されたＡＶアンプ３１との間で音声信号（もしくは音声データ）及びデータの送受信を行うためのインターフェースである。
【００２１】
分離部１０６は、選局部１０１で生成したＴＳから放送信号、ＳＩ／ＰＳＩ等を分離する。ＴＳは、放送信号，ＳＩ／ＰＳＩを含む多重化された信号である。放送信号は，例えば，ＭＰＥＧ－２の放送信号である。放送信号は、映像・音声のそれぞれを符号化した音声ＥＳ（Audio elementary stream）と映像ＥＳ（Video elementary stream）である。ＰＳＩは、ＴＳにどのようなプログラムが存在し、ＴＳに含まれる各ＥＳがどのプログラムに属しているかを記した情報である。また、ＳＩは、ＥＰＧ（Electric program guide）情報（番組情報）を含んでいる。
【００２２】
デコード部１０７は、分離部１０６で分離された音声ＥＳ、映像ＥＳをデコードして音声信号、映像信号を生成する。生成された音声信号は、音声信号処理部１０８および（端子１０４を介して）ＡＶアンプ３１へ出力される。また、映像信号は、表示部１０Ｃへ入力される。表示部１０Ｃは、デコード部１０７から入力される映像信号、もしくは端子１０２を介して記憶再生装置４１から入力される映像信号に基づいて映像を表示する。
【００２３】
端子１１０には、ＡＶアンプ３１からの信号ケーブルが接続される。端子１１０を介して、ＡＶアンプ３１から出力されるセンタースピーカ用の音声信号（モノラル音声信号）が音声信号処理部１０８へ入力される。
【００２４】
音声処理部１０８は、ＤＳＰ（Digital signal processor）等の回路により構成される。音声信号処理部１０８は、ＡＶアンプ３１を使用している場合（ＡＶアンプ３１がＯＮしている場合）、ＡＶアンプ３１から入力されるモノラル音声信号をツィータＴ３、およびウーハーＷ１、Ｗ２へ入力する。この場合、ツィータＴ３、およびウーハーＷ１、Ｗ２は、５．１ｃｈの音響システムのセンタースピーカとして機能する。また、ＡＶアンプ３１を使用していない場合、音声信号処理部１０８は、デコード部１０７もしくは端子１０２を介して記憶再生装置４１から入力される音声信号をツィータＴ１，Ｔ２およびウーハーＷ１、Ｗ２へ入力する。増幅部１０９は、音声信号処理部１０８から入力される音声信号を増幅してスピーカ部１０Ｂへ入力する。
【００２５】
図３は、第１の実施形態に係る音声信号の処理系統の構成を示す図である。音声信号処理部１０８は、制御部１０８ａ、ミュート部１０８ｂ，１０８ｃ、セレクタ部１０８ｄ、信号処理部１０８ｅ、ＨＰＦ（High pass filter）１０８ｆ，１０８ｇ、ＬＰＦ（Low pass filter）１０８ｈを具備する。増幅部１０９は、アンプ１０９ａから１０９ｃを具備する。

【００２６】
ミュート部１０８ｂは、制御部１０８ａからの指示に応じて、入力されるモノラル音声信号をミュート（消音）する。ミュート部１０８ｃは、制御部１０８ａからの指示に応じて、入力されるステレオ音声信号をミュート（消音）する。セレクタ部１０８ｄは、制御部１０８ａからの指示に応じて、入力されるステレオ音声信号またはモノラル音声信号のいずれかを選択する。
【００２７】
信号処理部１０８ｅは、ミュート部１０８ｂ，１０８ｃおよびセレクタ部１０８ｄから入力される音声信号を処理する。具体的には、音量制御や音質設定（低音／高音の増幅／減衰）及びサラウンド等の処理を行う。なお、信号処理部１０８ｅを、ミュート部１０８ｂ，１０８ｃおよびセレクタ部１０８ｄの前段へ挿入する形態としてもよい。
【００２８】
ＨＰＦ１０８ｆは、信号処理部１０８ｅから入力されるモノラル音声信号のうち高音域成分（高周波数成分）を通過させ、ＡＭＰ１０９ａへ入力する。ＨＰＦ１０８ｇは、信号処理部１０８ｅから入力されるステレオ音声信号のうち高音域成分を通過させ、ＡＭＰ１０９ｂへ入力する。ＬＰＦ１０８ｈは、信号処理部１０８ｅから入力されるステレオ音声信号もしくはモノラル音声信号のうち低音域成分（低周波数成分）を通過させ、ＡＭＰ１０９ｃへ入力する。
【００２９】
ＡＭＰ１０９ａは、ＨＰＦ１０８ｆから入力されるモノラル音声信号を増幅してツィータＴ３へ入力する。ＡＭＰ１０９ｂは、ＨＰＦ１０８ｇから入力されるステレオ音声信号を増幅してツィータＴ１，Ｔ２へ入力する。ＡＭＰ１０９ｃは、ＬＰＦ１０８ｈから入力されるステレオ音声信号もしくはモノラル音声信号を増幅しウーハーＷ１，Ｗ２へ入力する。
【００３０】
なお、ＨＰＦ１０８ｆ，１０８ｇおよびＬＰＦ１０８ｈは、ＦＩＲ型（Finite impulse response：有限インパルス応答）のフィルタであり、アナログフィルタでは近似的にしか実現できなかったリニアフェーズ（定遅延）特性が実現できる。リニアフェーズとは、位相特性がどの周波数に対しても直線となる特性のことである。つまり、全ての周波数成分が同じ時間だけ遅延するので、波形が乱れることなく忠実な波形の再現が可能となる。このため、フィルタ処理において位相遅れを考慮することなくシステム調整が可能である。なお、アナログフィルタとの比較結果を、図６Ａから図７Ｃを参照して後述する。
【００３１】
制御部１０８ａは、ＡＶアンプ３１を使用しているかどうかに応じて、ミュート部１０８ｂ，１０８ｃおよびセレクタ部１０８ｄを制御する。ＡＶアンプ３１を使用しているかどうかは、ＨＤＭＩによるＡＶアンプ３１との通信から確認できる。なお、ＡＶアンプ３１を使用するかどうかを、後述するリモコン１１２で設定できるように構成し、該設定内容に基づいて、ＡＶアンプ３１の使用の有無を確認してもよい。
【００３２】
ＡＶアンプ３１を使用していない場合、ユーザは、外部スピーカを使用していないため、スピーカ部１０Ｂからステレオ音声を出力する必要がある。このため、制御部１０８ａは、モノラル音声信号をミュートするようミュート部１０８ｂを制御する。また、制御部１０８ａは、ステレオ音声信号を選択するようセレクタ部１０８ｄを制御する。上記制御により、スピーカ部１０Ｂの左右にそれぞれ配置されたウーハーＷ１、ツィータＴ１およびウーハーＷ２、ツィータＴ２からステレオ音声が出力される。
【００３３】
ＡＶアンプ３１を使用している場合、ユーザは、外部スピーカを使用しているため、スピーカ部１０Ｂをセンタースピーカとして使用する必要がある。このため、制御部１０８ａは、ステレオ音声信号をミュートするようミュート部１０８ｃを制御する。また、制御部１０８ａは、モノラル音声信号を選択するようセレクタ部１０８ｄを制御する。上記制

御により、スピーカ部１０Ｂの中央部に配置されたツィータＴ３およびウーハーＷ１，Ｗ２からモノラル音声が出力される。この場合、外部スピーカであるスピーカ２１から２４からも音声が出力される（ＡＶアンプ３１から外部スピーカであるスピーカ２１から２４へ音声信号が入力されているため）。

【００３４】

リモコン受信部１１１は、リモートコントローラ１１２（以下、リモコン１１２と称する）から赤外線等の無線により送信される操作信号を受信する。リモコン１１２は、「選択」キーや「決定」キーなど、音声出力装置１の操作に必要な各種キーを備える。ユーザは、リモコン１１２を使用して、ＡＶアンプ３１および記憶再生装置４１を操作する。

【００３５】

（動作の説明）

次に、第１の実施形態に係る音響システム１の動作について説明する。図４は、第１の実施形態に係る音響システム１の動作を示すフローチャートである。選局部１０１は、アンテナで受信された放送信号から所望のチャンネルを選局する（ステップＳ１０１）。選局部１０１は、選局した放送信号を復調してＴＳ（トランスポートストリーム）を生成する。

【００３６】

分離部１０６は、選局部１０１で生成したＴＳから放送信号、ＳＩ／ＰＳＩ等を分離する（ステップＳ１０２）。デコード部１０７は、分離部１０６で分離された音声ＥＳ、映像ＥＳをデコードして音声信号、映像信号を生成する（ステップＳ１０３）。分離部１０６は、生成した音声信号を音声信号処理部１０８へ入力する。また、分離部１０６は、生成した映像信号を表示部１０Ｃへ入力する。

【００３７】

音声信号処理部１０８の制御部１０８ａは、ＡＶアンプ３１を使用しているかどうかを判定する（ステップＳ１０４）。ＡＶアンプ３１を使用している場合（ステップＳ１０４のＹｅｓ）、制御部１０８ａは、ステレオ音声信号をミュートするようミュート部１０８ｃを制御する（ステップＳ１０５）。また、制御部１０８ａは、モノラル音声信号を選択するようセレクタ部１０８ｄを制御する（ステップＳ１０６）。

【００３８】

ＡＶアンプ３１を使用していない場合（ステップＳ１０４のＮｏ）、制御部１０８ａは、モノラル音声信号をミュートするようミュート部１０８ｂを制御する（ステップＳ１０７）。また、制御部１０８ａは、ステレオ音声信号を選択するようセレクタ部１０８ｄを制御する（ステップＳ１０８）。表示部１０Ｃおよびスピーカ部１０Ｂは、入力される映像信号および音声信号に応じて、映像および音声を出力する（ステップＳ１０９）。なお、上記説明では、放送信号を選局する場合について説明したが、記憶再生装置４１で再生されるコンテンツ等を視聴する場合は、ステップＳ１０４から処理を開始する。

【００３９】

（比較例との比較）

図５は、比較例に係る音声信号の処理系統の構成を示す図である。図５に示すように、比較例では、各スピーカ（図５の場合、ツィータＴ１，Ｔ２およびウーハーＷ１，Ｗ２）に入力する音声信号を共通の（一つの）増幅器ＡＭＰで増幅している。増幅器ＡＭＰで増幅された音声信号は、スピーカ毎に分岐される。分岐された音声信号は、それぞれハイパスフィルタＨＰＦ－Ａ，ＨＰＦ－Ｂおよびローパスフィルタ ＬＰＦ－Ａ，ＬＰＦ－Ｂを介して、ツィータＴ１，Ｔ２およびウーハーＷ１，Ｗ２へ入力される。

【００４０】

ハイパスフィルタＨＰＦ－Ａ，ＨＰＦ－Ｂおよびローパスフィルタ ＬＰＦ－Ａ，ＬＰＦ－Ｂは、コイルＬ及びコンデンサＣの組み合わせで構成されるアナログフィルタである。ハイパスフィルタＨＰＦ－Ａ，ＨＰＦ－Ｂは、入力される音声信号のうち高音域成分を分離して通過させる。ローパスフィルタ ＬＰＦ－Ａ，ＬＰＦ－Ｂは、入力される音声信号のうち低音域成分を分離して通過させる。

【００４１】
つまり、比較例では、増幅器ＡＭＰの出力をスピーカ内部もしくは近傍に配したコイルＬ及びコンデンサＣの組み合わせで構成されるＬＣネットワーク（図５ではＬＰＦ－Ａ，ＬＰＦ－Ｂ，ＨＰＦ－Ａ，ＨＰＦ－Ｂ）でスピーカ毎の帯域に分離している。具体的には、上記ＬＣネットワークにより音声信号を高音域と低音域に分離し、この分離した音声信号のうち高音域の音声信号をツィータＴ１，Ｔ２へ入力し、低音域の音声信号をウーハーＷ１，Ｗ２へ入力している。

【００４２】
しかしながら、音声信号をハイパスフィルタや高音域または低音域に分離する際、遮断周波数近傍（ネットワークで分離される帯域の端）においてコンデンサＣやコイルＬに起因する位相乱れが発生する。この位相乱れを低減させる手法の一つとして、スピーカ毎に個別のアンプを設けて音声信号を増幅するマルチアンプ方式がある。しかし、上記マルチアンプ方式を用いた場合であっても、音声信号の分離にＦＩＲ（Finite impulse response）に代表されるようなLinkwitz-Riley方式のフィルタを適用すると、合成波形のトランジェント特性（立ち上がりの特性）になまりが生じる。

【００４３】
図６Ａから図６Ｃは、Linkwitz-Riley方式のフィルタを適用した場合におけるトランジェント特性を示す図である。図６Ａは、ウーハーとツィータとの合成波形を示す図である。図６Ｂは、ウーハーの波形を示す図である。図６Ｃは、ツィータの波形を示す図である。Linkwitz-Riley方式のフィルタを適用した場合、図６Ｂ、図６Ｃに示すように、ウーハー、ツィータ共に波形の立ち上がりになまりが生ずる。このため、図６Ａに示すように、ウーハーとツィータとの合成波形においても、波形の立ち上がり（破線で囲んだ部分）になまりが生ずる。

【００４４】
一方、第１の実施形態に係る音声出力装置１０では、ＨＰＦやＬＰＦとしてLinear-Phase Filterを用いている。このため、合成波形のトランジェント特性（立ち上がりの特性）になまりが生じるのを効果的に抑制できる。

【００４５】
図７Ａから図７Ｃは、Linear-Phase Filter方式のフィルタを適用した場合におけるトランジェント特性を示す図である。図７Ａは、ウーハーとツィータとの合成波形を示す図である。図７Ｂは、ウーハーの波形を示す図である。図７Ｃは、ツィータの波形を示す図である。図７Ｂ、図７Ｃに示すように、ウーハー、ツィータ共に波形の立ち上がりにおけるなまりを効果的に抑制できる。このため、図７Ａに示すように、ウーハーとツィータとの合成波形においても、波形の立ち上がり（破線で囲んだ部分）におけるなまりを効果的に抑制できる。

【００４６】
なお、遮断特性（減衰特性）を十分にとるにはＦＩＲのｔａｐ数を増やす必要があった。しかし、近年音声用のＤＳＰ等のデジタルデバイスが高性能化していることから十分な遮断特性（減衰特性）が得られるｔａｐ数を有したＦＩＲを構築することが可能である。このため、Linear-Phase Filterをチャンネルデバイダーとして用いることが可能となった。

【００４７】
以上のように、第１の実施形態に係る音声出力装置１０は、一体的に形成されたスピーカボックスの左右にそれぞれ配置されたステレオ音声再生用のウーハーＷ１、Ｗ２とツィータＴ１、Ｔ２との間にツィータＴ３が配置したスピーカ部１０Ｂを具備する。そして、外部スピーカ２１から２４の使用時には、ツィータＴ１、Ｔ２へのステレオ音声信号の入力を停止し、ＡＶアンプ３１から供給されるモノラル音声信号をウーハーＷ１、Ｗ２およびツィータＴ３へ入力する。つまり、外部スピーカ２１から２４の使用時には、ウーハーＷ１、Ｗ２およびツィータＴ３が５．１ｃｈの音響システムを構成するセンタースピーカとして機能する。

【００４８】
このため、ユーザの正面にセンタースピーカを配置することができ、音声の定位が向上する。また、ウーハーＷ１、Ｗ２の中心に高音用スピーカであるツィータＴ３を配置しているので、スピーカ部１０Ｂをセンタースピーカとして機能させる場合（モノラル音声を出力）、モノラル音声の特性をより効果的に得ることができ音声の定位感が向上する。また、高音用スピーカであるツィータＴ１、Ｔ２をスピーカ部１０Ｂの両端に配置しているので、通常のスピーカとして機能させる場合（ステレオ音声を出力）、ステレオの特性となる左右の分離感が向上しその特性をより効果的に得ることができる。これにより、ユーザによる視聴の弊害となることもなく、また意匠性およびその機能性についても向上することが可能となり、ＡＶ機器が具備しているスピーカとの共存性の問題もなくなる。

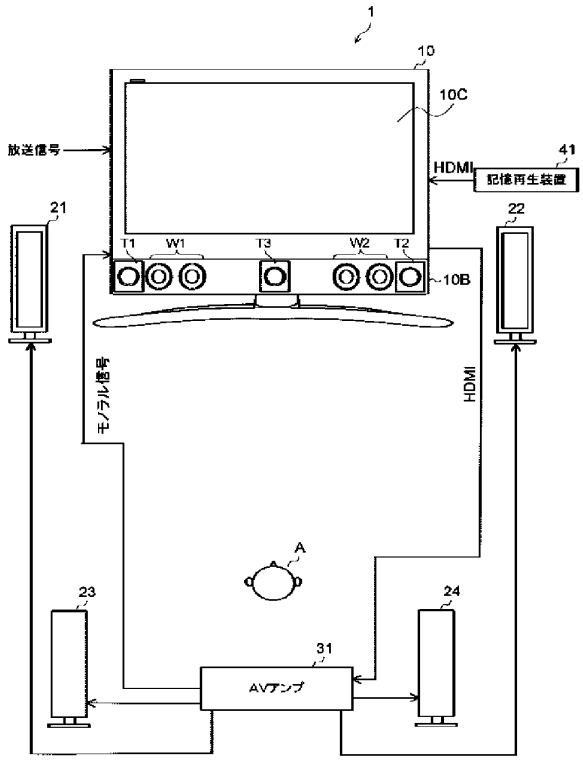
【００４９】
さらに、第１の実施形態では、音声信号処理部１０８をＤＳＰで構成し、ハイパスフィルタＨＰＦ１０８ｆ，１０８ｇやローパスフィルタＬＰＦ１０８ｈとしてLinear-Phase Filterを用いている。このため、合成波形のトランジェント特性（立ち上がりの特性）になまりが生じるのを効果的に抑制できる。アナログフィルタを構成するＬＣネットワークは、最大でも－１８ｄＢ／ｏｃｔが限界であるが、この第１の実施形態に係る音声信号処理部１０８が具備するフィルタでは、図６Ａから図７Ｃを参照して説明したように遮断特性を急峻に設定できる。

【００５０】
このため各スピーカの遮断周波数近傍での相互干渉が低減できる。特に、低音域の音声信号が入力された場合、破損する可能性のあるツィータ（Tweeter）では、音声信号の遮断特性を十分に取れるので、使用できる音声帯域を広く（遮断周波数の設定を低く）することができる。また、一般的には、遮断特性（減衰特性）を大きくした場合、遮断周波数近傍での位相のうねり（位相の回転）が増加する。このため、遮断周波数近傍での各スピーカの音のつながりが悪くなる傾向がある。しかし、この第１の実施形態では、Linear-Phase Filterを用いるので、遮断周波数近傍での急激な位相の回転（位相変化）を抑制できる。このため各スピーカ間の音のつながりを効果的に改善できる。

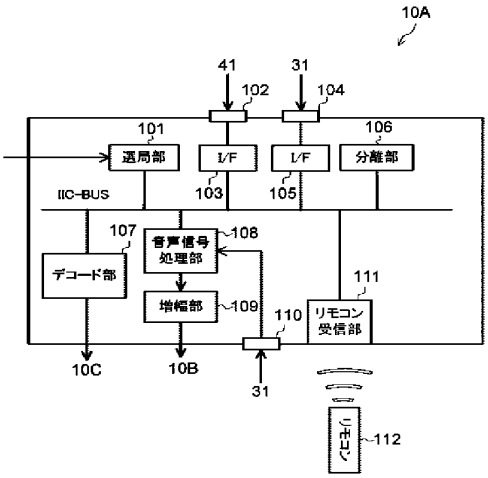
【００５１】
（その他の実施形態）
なお、本発明は上記実施形態そのままに限定されるものではなく、実施段階ではその要旨を逸脱しない範囲で構成要素を変形して具体化できる。例えば、第１の実施形態では、５．１ｃｈの音響システムについて説明したが、センタースピーカを使用する音響システムであれば適用が可能である。また、図１では、記憶再生装置４１を音声出力装置１０へ接続する構成としたが、記憶再生装置４１をＡＶアンプ３１へ接続する構成としてもよい。

【符号の説明】
【００５２】
１…音響システム、１０…音声出力装置、２１から２４…スピーカ、３１…ＡＶアンプ、４１…記憶再生装置、１０１…選局部、１０２，１０４，１１０…端子、１０３，１０５…Ｉ／Ｆ、１０６…分離部、１０７…デコード部、１０８…音声処理部、１０９…増幅部、１１１…リモコン受信部、１１２…リモートコントローラ（リモコン）。

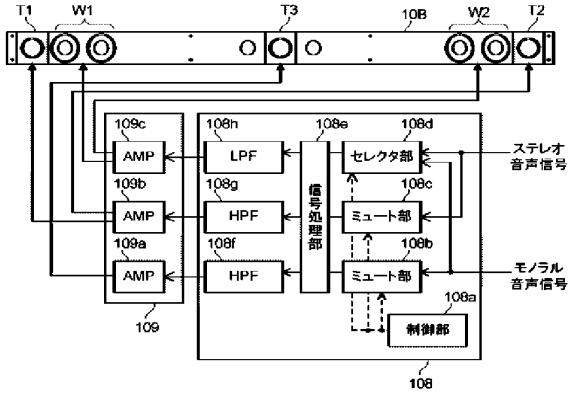
【図１】


1
10
10C
放送信号
HDMI
41
記憶再生装置
21
22
T1
W1
T3
W2
T2
10B
モノラル信号
HDMI
A
23
24
31
AVアンプ

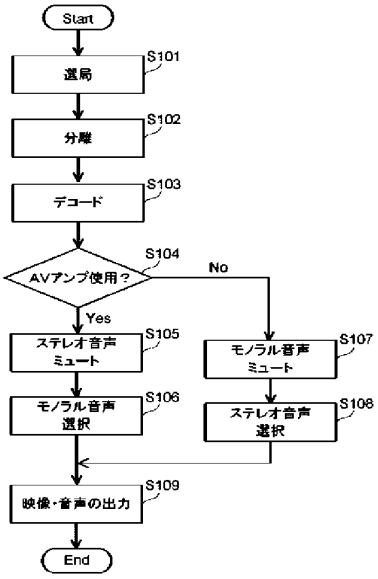
【図２】


10A
41
31
102
104
101
106
放送信号
選局部
I/F
I/F
分離部
IIC-BUS
103
105
107
音声信号処理部
108
デコード部
111
増幅部
109
110
リモコン受信部
10C
10B
31
リモコン
112

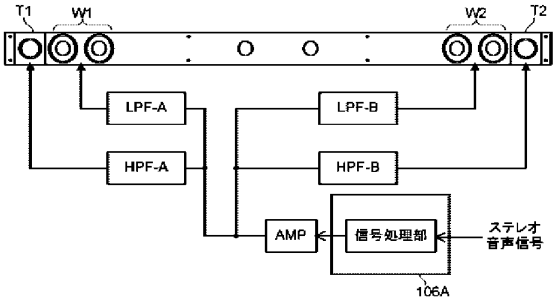
【図３】


T1
W1
T3
10B
W2
T2
109c
AMP
109b
AMP
109a
AMP
109
108h
LPF
108g
HPF
108f
HPF
108e
信号処理部
108d
セレクタ部
108c
ミュート部
108b
ミュート部
108a
制御部
108
ステレオ音声信号
モノラル音声信号

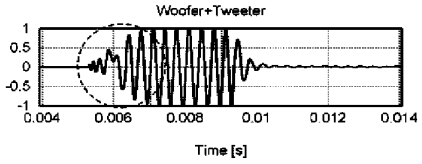
【図４】


Start
選局
S101
分離
S102
デコード
S103
AVアンプ使用？
S104
No
Yes
ステレオ音声ミュート
S105
モノラル音声選択
S106
モノラル音声ミュート
S107
ステレオ音声選択
S108
映像・音声の出力
S109
End

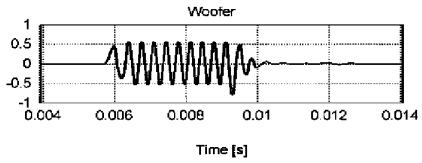
【図５】



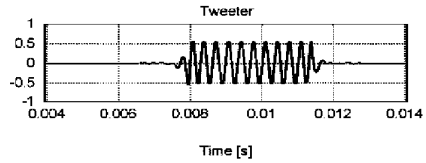

【図６Ａ】



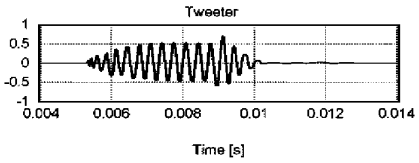

【図６Ｂ】



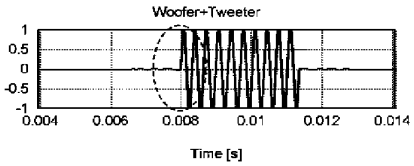

【図７Ｃ】



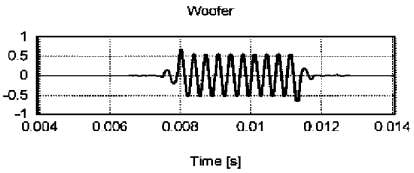

【図６Ｃ】




【図７Ａ】




【図７Ｂ】



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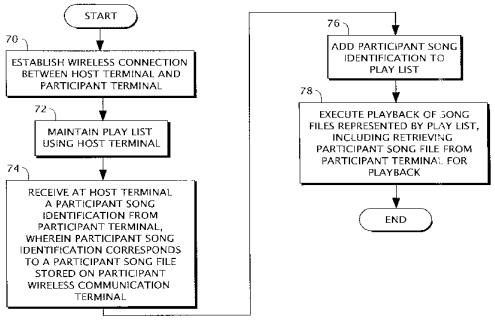
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**(54) Title:** MOBILE WIRELESS COMMUNICATION TERMINALS, SYSTEMS, METHODS, AND COMPUTER PROGRAM PRODUCTS FOR PROVIDING A SONG PLAY LIST




**(57) Abstract:** A mobile wireless communication terminal includes a wireless communication module and a controller. The wireless communication module is configured to communicate with other communication terminals over a wireless interface. The controller is configured to establish a connection with a participant wireless communication terminal via the wireless communication module, to maintain a play list representing song files to be played, to receive a participant song identification from the participant wireless communication terminal, wherein the participant song identification corresponds to a participant song file stored on the participant wireless communication terminal, to add the participant song identification to the play list, and to thereafter execute playback of the song files represented by the play list, including retrieving the participant song file from the participant wireless communication terminal for playback.

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# MOBILE WIRELESS COMMUNICATION TERMINALS, SYSTEMS, METHODS, AND COMPUTER PROGRAM PRODUCTS FOR PROVIDING A SONG PLAY LIST

## FIELD OF THE INVENTION

**[001]** The present invention relates to electronic devices and, more particularly, to electronic devices, methods and computer program products for playing song files.

## BACKGROUND OF THE INVENTION

**[002]** Mobile electronic devices, such as wireless communication terminals (*e.g.*, cellular telephones), are widely used to store and playback song files. A user may wish to play a song file on another device such as a media center (*e.g.*, a PC or laptop, a television, an audio receiver, etc.) or another wireless communication terminal. This may be accomplished by connecting the electronic device to the other device via a cable or a wireless link (*e.g.*, a Bluetooth connection) if the other device is equipped with a suitable communication module, which may be an integrated module or an auxiliary (*e.g.*, plug- in) module. Song files may be sent, one by one, from one or more mobile electronic devices to the playback device(s).

## SUMMARY OF THE INVENTION

**[003]** According to embodiments of the present invention, a mobile wireless communication terminal includes a wireless communication module and a controller. The wireless communication module is configured to communicate with other communication terminals over a wireless interface. The controller is configured to establish a connection with a participant wireless communication terminal via the wireless communication module, to maintain a play list representing song files to be played, to receive a participant song identification from the participant wireless communication terminal, wherein the participant song identification corresponds to a participant song file stored on the participant wireless communication terminal, to add the participant song identification to the play list, and to thereafter execute playback

of the song files represented by the play list, including retrieving the participant song file from the participant wireless communication terminal for playback.

**[004]** The controller may be configured to establish a connection with a plurality of participant wireless communication terminals, to receive a plurality of participant song identifications from the plurality of participant wireless communication terminals, wherein each participant song identification corresponds to a respective participant song file stored on a respective one of the plurality of participant wireless communication terminals, to add each of the participant song identifications to the play list, and to retrieve the participant song files from each of the respective participant wireless communication terminals for playback.

**[005]** According to some embodiments, the controller is configured to retrieve and execute the participant song file from the participant wireless communication terminal as a streaming music file.

**[006]** According to some embodiments, the controller is configured to retrieve the participant song file from the participant wireless communication terminal, to store the participant song file on the wireless communication terminal, and to thereafter execute playback of the stored participant song file.

**[007]** The controller may be configured to send a playback signal to a media center for playback of the song files represented by the play list on the media center.

**[008]** According to some embodiments, the wireless communication terminal includes a sound transducer. The controller is configured to play the song files represented by the play list using the sound transducer.

**[009]** The controller may be configured to send a playback signal to at least one participant wireless communication terminal for playback of the song files represented by the play list on the at least one participant wireless communication terminal.

**[010]** The controller may be configured to receive a song catalog listing from the participant wireless communication terminal representing available song files stored on the participant wireless communication terminal, to receive user input selecting from the available song files, and to add the selected available song files to the play list.

**[011]** According to some embodiments, the controller is configured to send a listing signal to the participant wireless communication terminal representing the play list for display of the play list on the participant wireless communication terminal.

**[012]** The controller may be configured to modify the play list responsive to user input.

**[013]** According to some embodiments, the wireless communication module is configured to communicate with other communication terminals over a direct point-to-point wireless interface. The controller is configured to establish the connection with the participant wireless communication terminal, receive the participant song identification from the participant wireless communication terminal, and retrieve the participant song file from the participant wireless communication terminal for playback all via the direct point-to-point wireless interface.

**[014]** According to some embodiments, the wireless communication module comprises a short range transmitter. The controller is configured to establish the connection with the participant wireless communication terminal, receive the participant song identification from the participant wireless communication terminal, and retrieve the participant song file from the participant wireless communication terminal for playback all via the short range transmitter. The short range transmitter may be a Bluetooth™ transmitter.

**[015]** The wireless communication terminal may include a cellular telephone.

**[016]** According to further embodiments of the present invention, a system for providing a song play list includes a host mobile wireless communication terminal and a participant wireless communication terminal. The host wireless communication terminal includes a wireless communication module and a controller. The wireless communication module is configured to communicate with other communication terminals over a wireless interface. The controller is configured to establish a connection with the participant wireless communication terminal via the wireless communication module, to maintain a play list representing song files to be played, to receive a participant song identification from the participant wireless communication terminal, wherein the participant song identification corresponds to a participant song file stored on the participant wireless communication terminal, to add the participant song identification to the play list, and to thereafter execute playback of the song files

represented by the play list, including retrieving the participant song file from the participant wireless communication terminal for playback.

**[017]** According to some embodiments, the system includes a plurality of participant wireless communication terminals. The controller is configured to establish a connection with each of the plurality of participant wireless communication terminals, to receive a plurality of participant song identifications from the plurality of participant wireless communication terminals, wherein each participant song identification corresponds to a respective participant song file stored on a respective one of the plurality of participant wireless communication terminals, to add each of the participant song identifications to the play list, and to retrieve the participant song files from each of the respective participant wireless communication terminals for playback.

**[018]** According to further embodiments of the present invention, methods for providing a song play list using a host wireless communication terminal includes: establishing a wireless connection between the host wireless communication terminal and a participant wireless communication terminal; maintaining a play list using the host wireless communication terminal, the play list representing song files to be played; receiving at the host wireless communication terminal a participant song identification from the participant wireless communication terminal, wherein the participant song identification corresponds to a participant song file stored on the participant wireless communication terminal; adding the participant song identification to the play list; and thereafter executing playback of the song files represented by the play list, including retrieving the participant song file from the participant wireless communication terminal for playback.

**[019]** According to further embodiments of the present invention, a computer program product for providing a song play list using a host wireless communication terminal includes a computer usable medium having computer usable program code embodied therein, the computer usable program code comprising: computer usable program code configured to establish a wireless connection between the host wireless communication terminal and a participant wireless communication terminal; computer usable program code configured to maintain a play list using the host wireless communication terminal, the play list representing song files to be played; computer usable program code configured to receive at the host wireless communication

terminal a participant song identification from the participant wireless communication terminal, wherein the participant song identification corresponds to a participant song file stored on the participant wireless communication terminal; computer usable program code configured to add the participant song identification to the play list; and computer usable program code configured to thereafter execute playback of the song files represented by the play list, including retrieving the participant song file from the participant wireless communication terminal for playback.

**[020]** Further features, advantages and details of the present invention will be appreciated by those of ordinary skill in the art from a reading of the figures and the detailed description of the preferred embodiments that follow, such description being merely illustrative of the present invention.

## BRIEF DESCRIPTION OF THE DRAWINGS

**[021]** **Figure 1** is a schematic diagram of a mobile wireless communication terminal according to some embodiments of the present invention and an exemplary base station transceiver.

**[022]** **Figure 2** is a flowchart illustrating methods in accordance with some embodiments of the present invention.

**[023]** **Figure 3** is a schematic diagram of a song file playback system according to some embodiments of the present invention including the mobile wireless communication terminal of **Figure 1**.

**[024]** **Figure 4** is a schematic diagram illustrating a display of the mobile wireless communication terminal of **Figure 1** in accordance with some embodiments of the present invention.

**[025]** **Figure 5** is a schematic diagram of a song file playback system according to further embodiments of the present invention including the mobile wireless communication terminal of **Figure 1**.

**[026]** **Figure 6** is a schematic diagram of a song file playback system according to further embodiments of the present invention including the mobile wireless communication terminal of **Figure 1**.

DETAILED DESCRIPTION OF EMBODIMENTS OF THE INVENTION

**[027]** The present invention now will be described more fully with reference to the accompanying drawings, in which embodiments of the invention are shown. However, this invention should not be construed as limited to the embodiments set forth herein. Rather, these embodiments are provided so that this disclosure will be thorough and complete, and will fully convey the scope of the invention to those skilled in the art. Like numbers refer to like elements throughout.

**[028]** As used herein, the term "comprising" or "comprises" is open-ended, and includes one or more stated features, integers, elements, steps, components or functions but does not preclude the presence or addition of one or more other features, integers, elements, steps, components, functions or groups thereof.

**[029]** As used herein, the term "and/or" includes any and all combinations of one or more of the associated listed items.

**[030]** As used herein, the common abbreviation "*e.g.*", which derives from the Latin phrase "exempli gratia," may be used to introduce or specify a general example or examples of a previously mentioned item, and is not intended to be limiting of such item. If used herein, the common abbreviation "*i.e.*", which derives from the Latin phrase "id est," may be used to specify a particular item from a more general recitation.

**[031]** The terminology used herein is for the purpose of describing particular embodiments only and is not intended to be limiting of the invention. As used herein, the singular forms "a", "an" and "the" are intended to include the plural forms as well, unless the context clearly indicates otherwise.

**[032]** Unless otherwise defined, all terms (including technical and scientific terms) used herein have the same meaning as commonly understood by one of ordinary skill in the art to which this invention belongs. It will be further understood that terms, such as those defined in commonly used dictionaries, should be interpreted as having a meaning that is consistent with their meaning in the context of the relevant art and will not be interpreted in an idealized or overly formal sense unless expressly so defined herein.

**[033]** It will be understood that when an element is referred to as being "coupled" or "connected" to another element, it can be directly coupled or connected to the other element or intervening elements may also be present. In contrast, when

an element is referred to as being "directly coupled" or "directly connected" to another element, there are no intervening elements present. Furthermore, "coupled" or "connected" as used herein may include wirelessly coupled or connected.

**[034]** Well-known functions or constructions may not be described in detail for brevity and/or clarity.

**[035]** The present invention may be embodied as methods, electronic devices, and/or computer program products. Accordingly, the present invention may be embodied in hardware and/or in software (including firmware, resident software, micro-code, *etc.*), which may be generally referred to herein as a "circuit" or "module". Furthermore, the present invention may take the form of a computer program product on a computer-usable or computer-readable storage medium having computer-usable or computer-readable program code embodied in the medium for use by or in connection with an instruction execution system. In the context of this document, a computer-usable or computer-readable medium may be any medium that can contain, store, communicate, propagate, or transport the program for use by or in connection with the instruction execution system, apparatus, or device.

**[036]** Embodiments according to the present invention are described with reference to block diagrams and/or operational illustrations of methods and communication terminals. In this regard, each block may represent a module, segment, or portion of code, which comprises one or more executable instructions for implementing the specified logical function(s). It is to be understood that each block of the block diagrams and/or operational illustrations, and combinations of blocks in the block diagrams and/or operational illustrations, can be implemented by radio frequency, analog and/or digital hardware, and/or program instructions. These program instructions may be provided to a controller, which may include one or more general purpose processors, special purpose processors, ASICs, and/or other programmable data processing apparatus, such that the instructions, which execute via the controller and/or other programmable data processing apparatus, create means for implementing the functions/acts specified in the block diagrams and/or operational block or blocks. In some alternate implementations, the functions/acts noted in the blocks may occur out of the order noted in the operational illustrations. For example, two blocks shown in succession may in fact be executed substantially concurrently or

the blocks may sometimes be executed in the reverse order, depending upon the functionality/acts involved.

**[037]** These computer program instructions may also be stored in a computer-usable or computer-readable memory that may direct a computer or other programmable data processing apparatus to function in a particular manner, such that the instructions stored in the computer usable or computer-readable memory produce an article of manufacture including instructions that implement the function specified in the flowchart and/or block diagram block or blocks.

**[038]** The computer-usable or computer-readable medium may be, for example but not limited to, an electronic, magnetic, optical, electromagnetic, infrared, or semiconductor system, apparatus, device, or propagation medium. More specific examples (a nonexhaustive list) of the computer-readable medium include the following: hard disks, optical storage devices, a transmission media such as those supporting the Internet or an intranet, magnetic storage devices, an electrical connection having one or more wires, a portable computer diskette, a random access memory (RAM), a read-only memory (ROM), an erasable programmable read-only memory (EPROM or Flash memory), an optical fiber, and a compact disc read-only memory (CD-ROM).

**[039]** Computer program code for carrying out operations of the present invention may be written in an object oriented programming language such as Java®, Smalltalk or C++. However, the computer program code for carrying out operations of the present invention may also be written in conventional procedural programming languages, such as the "C" programming language and/or a lower level assembler language. It will be further appreciated that the functionality of any or all of the program modules may also be implemented using discrete hardware components, one or more application specific integrated circuits (ASICs), or a programmed digital signal processor or microcontroller.

**[040]** As used herein, "electronic component" means an active device as contrasted with a passive electrical connector or the like. An electronic component may include a processor.

**[041]** As used herein, "streamed" or "streaming" means that a file, such as an audio or song file, is continuously sent via a digital signal to a receiving device where

the audio or song file is concurrently played via a suitable receiving application. The digital signal is typically buffered.

**[042]** As used herein, a "communication terminal" includes, but is not limited to, a terminal that is configured to receive/transmit communication signals via a wireline connection, such as via a public-switched telephone network (PSTN), digital subscriber line (DSL), digital cable, or another data connection/network, and/or via a wireless interface with, for example, a cellular network, a satellite network, a wireless local area network (WLAN), and/or another communication terminal.

**[043]** When the communication terminal is configured to communicate over a wireless interface, it is referred to herein as a "wireless communication terminal" or a "wireless terminal." Examples of wireless terminals include, but are not limited to, a cellular telephone, personal data assistant (PDA), pager, and/or a computer that is configured to communicate data over a wireless communication interface that can include a cellular telephone interface, a Bluetooth interface, a wireless local area network interface (*e.g.*, 802.11), another RF communication interface, and/or an optical/infra-red communication interface.

**[044]** As used herein, "mobile terminals" may be portable, transportable, installed in a vehicle (aeronautical, maritime, or land-based), or situated and/or configured to operate locally and/or in a distributed fashion at any other location(s) on earth and/or in space.

**[045]** Some embodiments of the present invention will now be described below with respect to **Figures 1-6**. Some embodiments of the present invention provide mobile wireless communication terminals capable of providing a song play list including one or more song identifications from another wireless communication terminal.

**[046]** Referring now to **Figure 1**, an exemplary mobile wireless communication terminal **10A** in accordance with some embodiments of the present invention is illustrated. The wireless terminal **10A** is configured to communicate data with one or more other wireless terminals over a direct wireless communication interface therebetween, over another wireless communication interface through one or more cellular base stations, and/or over another wireless communication interface through a wireless local area network (WLAN) router.

**[047]** The wireless terminal **10A** may be a mobile radiotelephone forming a part of a radiotelephone communication system **2** as illustrated in **Figure 1**. The system **2** includes the mobile wireless communication terminal **10A** and a base station transceiver, which is part of a wireless communications network **5**. In some embodiments of the present invention, the network **5** includes a base station transceiver that includes the radio transceiver(s) that define an individual cell in a cellular network and communicates with the mobile terminal **10A** (via an interface **7**) and other mobile terminals in the cell using a radio-link protocol. It will be understood that, in some embodiments of the present invention, many base station transceivers may be connected through, for example, a mobile switching center and other devices to define the wireless communications network **5**.

**[048]** The mobile terminal **10A** in the illustrated embodiments includes a portable housing assembly **12**, a display **20**, a user interface **22** (*i.e.*, a man machine interface (MMI)) including a speaker **24** (*i.e.*, a sound transducer), a controller **30**, a communication module **32**, and a memory **34**. The foregoing components of the mobile terminal **10A** may be included in many conventional mobile terminals and their functionality is generally known to those skilled in the art. The mobile terminal **10A** further includes a song management module **40**, which may be stored in the memory **34**.

**[049]** The display **20** may be any suitable display screen assembly. For example, the display screen **28** may be a liquid crystal display (LCD) with or without auxiliary lighting (*e.g.*, a lighting panel).

**[050]** The user interface **22** may include any suitable input device(s) including, for example, a touch activated or touch sensitive device (*e.g.*, a touch screen), a joystick, a keyboard/keypad, a dial, a directional key or keys, and/or a pointing device (such as a mouse, trackball, touch pad, etc.). The speaker **24** generates sound responsive to an input audio signal. The user interface **22** can also include a microphone coupled to an audio processor that is configured to generate an audio data stream responsive to sound incident on the microphone.

**[051]** The controller **30** may support various functions of the mobile terminal **10A**. The controller **30** can be any commercially available or custom microprocessor, for example. In use, the controller **30** of the mobile terminal **10A** generates a display image on the display **20**.

**[052]** The memory **34** is configured to store digital information signals and data such as a digital audio signal and/or digital audio files.

**[053]** The communication module **32** is configured to communicate data over one or more wireless interfaces (*e.g.*, wireless interfaces **7**, **112**, **114**, **116**, **122**, and **134** as discussed herein (**Figures 1** and **3**)) to another remote wireless terminal as discussed herein. The communication module **32** can include a cellular communication module, a direct point-to-point connection module, and/or a WLAN module.

**[054]** With a cellular communication module, the wireless terminal **10A** can communicate via the base station(s) of the network **5** using one or more cellular communication protocols such as, for example, Advanced Mobile Phone Service (AMPS), ANSI-136, Global Standard for Mobile (GSM) communication, General Packet Radio Service (GPRS), enhanced data rates for GSM evolution (EDGE), code division multiple access (CDMA), wideband-CDMA, CDMA2000, and Universal Mobile Telecommunications System (UMTS). The cellular base stations may be connected to a Mobile Telephone Switching Office (MTSO) wireless network, which, in turn, can be connected to a PSTN and/or another network.

**[055]** A direct point-to-point connection module may include a direct RF communication module or a direct IR communication module. The direct RF communication module may include a Bluetooth module. With a Bluetooth module, the wireless terminal **10A** can communicate via an ad-hoc network through a direct point-to-point interface.

**[056]** With a WLAN module, the wireless terminal **10A** can communicate through a WLAN (*e.g.*, a router **120** (**Figure 3**)) using a communication protocol that may include, but is not limited to, 802.11a, 802.11b, 802.11e, 802.11g, and/or 802.11i.

**[057]** The communication module **32** can include a transceiver typically having a transmitter circuit and a receiver circuit, which respectively transmit outgoing radio frequency signals (*e.g.*, to the network **5**, a router or directly to another terminal) and receive incoming radio frequency signals (*e.g.*, from the network **5**, a router or directly to another terminal), such as voice and data signals, via an antenna. The communication module **32** may include a short range transmitter and receiver, such as a Bluetooth transmitter and receiver. The antenna may be an embedded

antenna, a retractable antenna or any antenna known to those having skill in the art without departing from the scope of the present invention. The radio frequency signals transmitted between the mobile terminal **10A** and the network **5**, router or other terminal may include both traffic and control signals (*e.g.*, paging signals/messages for incoming calls), which are used to establish and maintain communication with another party or destination. The radio frequency signals may also include packet data information, such as, for example, cellular digital packet data (CDPD) information. In addition, the transceiver may include an infrared (IR) transceiver configured to transmit/receive infrared signals to/from other electronic devices via an IR port.

**[058]** The mobile terminal **10A** may also be configured to electrically couple with another terminal via a wireline or cable for the transmission of digital communication signals therebetween. The mobile terminal **10A** may include further components such as a camera device configured to generate a still image and/or video data stream based on incident light.

**[059]** According to some embodiments, the mobile terminal **10A** is a handheld mobile terminal. By "handheld mobile terminal," it is meant that the outer dimensions of the mobile terminal are adapted and suitable for use by a typical operator using one hand. According to some embodiments, the total volume of the handheld mobile terminal **10A** is less than about 200 cc. According to some embodiments, the total volume of the handheld terminal **10A** is less than about 100 cc. According to some embodiments, the total volume of the handheld mobile terminal **10A** is between about 50 and 100 cc. According to some embodiments, no dimension of the handheld mobile terminal **10A** exceeds about 200 mm.

**[060]** A method for providing a song play list using a wireless communication terminal (*e.g.*, the mobile terminal **10A**) according to some embodiments of the present invention will now be described with reference to the flowchart of **Figure 2**. Referring to the embodiments of **Figure 2**, the method includes establishing a wireless connection between the host wireless communication terminal and a participant wireless communication terminal (**Block 70**). A play list is maintained using the host wireless communication terminal (**Block 72**). The play list represents song files to be played. A participant song identification from the participant wireless communication terminal is received at the host wireless

communication terminal (**Block 74**). The participant song identification corresponds to or designates a participant song file stored on the participant wireless communication terminal. The participant song identification is added to the play list (**Block 76**). Thereafter, playback of the song files represented by the play list is executed (**Block 78**). Execution of playback of the song file includes retrieving the participant song file from the participant wireless communication terminal for playback.

**[061]** According to some embodiments, connections are established between the host wireless communication terminal and a plurality of participant wireless communication terminals, and the host wireless communication terminal receives a plurality of participant song identifications from the plurality of participant wireless communication terminals, adds each of the participant song identifications to the play list, and retrieves the participant song files from each of the respective participant wireless communication terminals for playback. According to some embodiments, communication between the host wireless communication terminal and the participant wireless communication terminal is accomplished via a direct point-to-point interface, such as a Bluetooth wireless RF connection. According to some embodiments, communication between the host wireless communication terminal and the participant wireless communication terminal is accomplished via an indirect interface, such as through a WLAN or cellular-based system. Further aspects and embodiments of the present invention will be apparent from the following descriptions of further embodiments.

**[062]** With reference to **Figure 3**, a song file playback system **100A** according to embodiments of the present invention is shown therein. The system **100A** includes the mobile wireless communication terminal **10A** (also referred to herein as the "host wireless communication terminal" or "host terminal"), a plurality of additional participant wireless communication terminals **10B**, **10C**, **10D**, and **10E** (also referred to herein as the "participant wireless communication terminals" or "participant terminals"), and a media center **130**.

**[063]** The terminals **10B-E** may be configured as described above with regard to the terminal **10A**. The terminals **10B-E** each include a wireless communication module **32** and a song management module **40**. However, the respective song management modules may be differently configured for each terminal

**10A-E** depending on the intended functionality of the device. According to some embodiments, all or some of the terminals **10B-E** are mobile wireless communication terminals. According to some embodiments, all or some of the terminals **10A-E** are handheld mobile wireless communication terminals.

**[064]** The media center **130** includes apparatus adapted to convert an audio signal (*e.g.*, a digital audio signal) to corresponding sound. The media center **130** may include, for example, a PC or laptop, a television, an audio receiver, stereo equipment, etc. The illustrated media center **130** includes a wireless communication module **132** and sound transducers (speakers) **136**. The wireless communication module **132** may be integrated with the media center **130** or may be an auxiliary or plug-in wireless communication module such as the Bluetooth Media Viewer MMV-100 module or Bluetooth Media Viewer MMV-200 module, each available from Sony Ericsson of Sweden.

**[065]** The system **100A** will now be described using an illustrative example of use. A group of users at a gathering each have a respective one of the terminals **10A-E**. Various songs are stored on one or more (typically two or more) of the terminals **10A-E**. The users may wish to share the songs stored on their mobile terminals with the other users at the gathering by playing their songs on the media center **130**. With known and available technology, this can be accomplished by having each user send (via Bluetooth, etc.) his or her songs (*i.e.*, music audio files) to the media center **130** one at a time, song by song. However, this method requires substantial and active interaction from each contributing user. Such involvement may be inconvenient and/or not conducive to the setting (*e.g.*, a party).

**[066]** In accordance with embodiments of the present invention, the foregoing shortcomings can be overcome by creating and maintaining a play list of songs and executing playback of the songs (*i.e.*, the music audio files) using the host terminal **10A**. Typically, each terminal **10A-E** will have the appropriate song management module **40** (*e.g.*, software or firmware application) installed thereon.

**[067]** The host terminal **10A** is chosen to be the master or host terminal and the participant terminals **10B-E** are each designated as slave or participant terminals. The controller **30** of the host terminal **10A** establishes a wireless connection (*i.e.*, communicatively couples) with each of the participant terminals **10B-E**. According to some embodiments the wireless connection is a direct wireless communication

interface connection, according to some embodiments, a direct RF connection and, according to some embodiments, a Bluetooth connection. The connections may be established in known manner. For example, in the case of Bluetooth connections, the participant (slave) terminals **10B-E** may be set to a searchable/discoverable state and the host (master) terminal **10A** emits an inquiry to identify the available participant (slave) terminals **10B-E** to form a piconet or personal area network.

**[068]** As illustrated, the host terminal **10A** communicates with the participant terminals **10B**, **10C** and **10D** via direct point-to-point wireless interfaces or links **112**, **114** and **116**, respectively, and with the participant terminal **10E** via wireless interfaces or links **118**, **122** through a WLAN router **120**. It will be appreciated that, according to some embodiments, the interfaces may be various combinations of wireless interfaces that are direct (*e.g.*, Bluetooth) or indirect (*e.g.*, via a WLAN router or a cellular network **5**). According to some contemplated embodiments, all of the signals provided between the host terminal **10A** and the participant terminals **10B-E** to execute the song sharing procedure are provided via direct point-to-point wireless interfaces. According to some contemplated embodiments, all of the signals provided between the host terminal **10A** and the participant terminals to execute the song sharing procedure are provided via direct wireless radio frequency (RF) interfaces such as Bluetooth interfaces.

**[069]** Before or after establishing the connections, the host terminal **10A** may identify and designate valid participant terminals by any suitable method. According to some embodiments, the host terminal **10A** will poll or send an invitation to all or a selected group of potential participant terminals (*e.g.*, those within operational range of the host terminal's Bluetooth signal). The potential participant terminals may then opt in by replying with an acceptance of the invitation. Alternatively or additionally, the host terminal **10A** may accept unsolicited requests from participant terminals to participate. The host terminal **10A** may be used to define specific groups such as a listing of the potential participant terminals that will be permitted to participate (*i.e.*, contribute songs to the play list).

**[070]** The host terminal **10A** is also communicatively coupled to the media center **130** to provide wireless song data signals via a wireless interface or link **134** to the communication module **132**. Alternatively, the host terminal **10A** can be connected to the media center **130** using a wireline or signal cable.

**[071]** Once the connections are established between the host terminal **10A** and the participant terminals **10B-E**, each participant can send a participant song identification designating a song stored on the participant's terminal **10B-E**. The song management module **40** of the sending participant terminal **10B-E** may provide a user interface to facilitate the selection and sending of the song identification(s). For example, the module **40** may generate a list of the available stored songs and check boxes for selecting the song(s) to send to the host terminal **10A**.

**[072]** The host terminal **10A** receives the participant song identifications from the participant terminals **10B-E**. The song management module **40** of the host terminal **10A** creates and maintains a host play list of these song identifications. The host play list represents song files to be played.

**[073]** Each song management module **40** provides a display **150** on the associated terminal **10A-E** as shown in **Figure 4**. The display provided on the host terminal **10A** may differ from the display provided on the participant terminals **10B-E**. For example, the portions of the display **150** related to management functionality may be omitted from the participant terminal displays. Alternatively, the song management module **40** may provide no display on the participant terminals **10B-E**.

**[074]** In the illustrated embodiment, the display **150** includes a play list field **152** and control buttons **154** (*e.g.*, soft keys). The control buttons **154** will typically only be displayed on the host terminal display. A play list **156** is displayed in the play list field **152**. The play list **156** includes a row-by-row series of song identifications **156A**, each corresponding to a respective song file. As illustrated, each song identification includes a song artist, a song name, and a song play time corresponding to the associated song file, as well as an identification of the participant that has submitted the song identification. It will be appreciated that more, less and/or different information may be provided as well.

**[075]** The host may selectively manage play of the songs represented by the song list **156** using the control buttons **154**, for example. For example, the "PLAY" and "STOP" buttons may be used to start and stop transmission of the song files to the media center **130**. The "MOVE" button may be used to prioritize or change the order of the song identifications **156A** in the play list **156** (*i.e.*, to change the order in which the associated song files will be played). The "DELETE" button may be used to delete a song identification **156A** from the play list **156**. The "DETAILS" button may

be used to delete a song identification **156A** from the play list **156** so that the associated song file will not be played. The "RANDOM MIX" button may be used to cause the host terminal **10A** to execute playback of the song files (*i.e.*, send the song files to the media center **130**) in a random or other non-sequential order. Typically, the host terminal **10A** will execute playback of the song files in the listed sequence unless the random or other non-sequential mode is in effect.

**[076]** Other functionality could also be provided. For example, the host terminal **10A** may allow the user to change the order of the song identifications **156A** according to one or more selected attributes (*e.g.*, contributing participant, song length, etc.). The host terminal **10A** may be configured to designate which of the participant terminals **10B-E** are permitted to add song identifications to the play list **156**. The participant terminals **10B-E** may be enabled to edit or modify the song list **156** in addition to adding song identifications. In this case, the host terminal **10A** may be configured to allow the host to select which of the participant terminals **10B-E** are and are not authorized to modify the song play list **156** (*i.e.*, enable and disable the play list edit capability of the participant terminals).

**[077]** When the host terminal **10A** is in play mode, the controller **30** of the host terminal **10A** will identify the song identification **156A** that is to be played thereafter. The song identification identified may be the song identification that is to be played next. The host terminal **10A** will then send a song file request to the corresponding one of the participant terminals **10B-E** to retrieve the song file corresponding to the song identification.

**[078]** The corresponding participant terminal will then send a copy of the identified song file (which is stored on the participant terminal) to the host terminal **10A**. According to some embodiments, the participant terminal sends the song file to the host terminal **10A** as a copy of the song file that is then temporarily stored on the host terminal **10A** (*e.g.*, in the memory **34**). According to other embodiments, the participant terminal sends the song file to the host terminal **10A** as a streaming song file. According to some embodiments, the request and song file signals between the host terminal and the participant terminal are sent wirelessly and, according to some embodiments, via a direct wireless RF connection such as Bluetooth.

**[079]** The controller **30** of the host terminal **10A** then executes playback of the retrieved song file by sending the song file to the media center **130**. The song file

may be stored on the media center **130** for playback. Alternatively, the song file may be streamed to the media center **130**, for example, as the song file is streamed from the originating participant terminal to the host terminal **10A**. It may be preferable or necessary to stream the song file from the participant terminal to the host terminal and/or from the host terminal to the media center **130** if the allocated memory space on the host terminal **10A** is insufficient and/or storage of the song file on the host terminal **10A** is prevented or illegal. According to some embodiments, the song file, whether streamed or stored in whole, will be automatically erased (*i.e.*, without user intervention) from the host terminal **10A** during or after playback.

**[080]** The controller **30** of the host terminal **10A** may execute the foregoing steps for each song identification **156A** in turn and automatically (*i.e.*, without user intervention). As the host terminal **10A** runs through the song list **156** in this fashion, the host may modify the play list **156** as desired. Also, according to some embodiments, the participant terminals **10B-E** can add new song identifications to the song list **156** as the controller **30** of the host terminal **10A** runs through the play list **156**. According to some embodiments, new participant terminals can join the group and submit song identifications as the host terminal **10A** runs through the play list **156**.

**[081]** The system **100A** can provide a convenient and enjoyable mechanism for playing songs selected by a group of people. The system **100A** provides playback execution functionality and also allows the host terminal (and, in some cases, the participant terminals) to create, coordinate, control and/or manage the song play list. In practice, for example, partygoers can add songs from their own participant terminals to a song play list maintained on a host terminal (*e.g.*, the party host's own mobile terminal). When their song's turn arrives in the playback sequence, a copy of the song file will automatically be sent to the host terminal and played. Thus, the partygoer need not take any further action. When, in accordance with some embodiments, the request and song transfer signals are communicated between the host terminal and the participant terminal via a direct wireless connection (*e.g.*, an RF interface such as a Bluetooth connection), the partygoer may simply place his or her participant terminal in a pocket or handbag. Participants may be added and removed as the procedure is executed. For example, when a participant leaves the Bluetooth range, his or her songs may be deleted from or moved down the play list.

**[082]** Referring now to **Figure 5**, a system **100B** according to further embodiments of the present invention is shown therein including the host terminal **10A** and the participant terminals **10B-E**. The system **100B** differs from the system **100A** (**Figure 2**) in that the media center **130** is omitted and playback of the song files from the song play list **156** is conducted via the speaker **24** of the host terminal **10A**.

**[083]** Referring now to **Figure 6**, a system **100C** according to further embodiments of the present invention is shown therein including the host terminal **10A** and the participant terminals **10B-E**. The system **100C** differs from the system **100B** (**Figure 5**) in that playback of the song files from the song play list **156** is conducted via the speaker **24** of the host terminal **10A** and, additionally, through the respective speakers of the participant terminals **10B-E** and/or through one or more headsets (*e.g.*, in-ear stereo headsets) operatively connected to the participant terminals **10B-E**. More particularly, the controller **30** of the host terminal **10A** plays each song file in the same manner as described above and also sends the song file to the participant terminals **10B-E** for simultaneous playback. Thus, the host terminal **10A** creates and manages a song play list that may include song identifications from the participant terminals **10B-E**, retrieves copies of the song files from the appropriate participant terminals **10B-E** as needed, and distributes the copies of the song files to the participant terminals **10B-E** for playback. According to some embodiments, the song transfer signal is sent from the host terminal **10A** to the participant terminals **10B-E** wirelessly and, according to some embodiments via a direct wireless RF connection such as Bluetooth. According to some embodiments, the song files are streamed to the participant terminals **10B-E**. The host terminal **10A** may be configured to permit the host to designate which of the participant terminals **10B-E** will receive playback signals and which of the participant terminals **10B-E** are authorized to submit song identifications to the play list **156**, and these two groups may differ.

**[084]** The host terminal **10A** may be configured to allow the user to selectively choose the device or combination of devices for playback from the various options discussed above. For example, the host terminal **10A** may be configured to execute playback via only the speaker **24** of the host terminal **10A**, via the speaker of the host terminal **10A** and the speakers of the participant terminals **10B-E**, via the speakers of the participant terminals **10B-E** and the media center **130**, etc. It will be

appreciated that, when the song files are played back via the speakers of the participant terminals **10B-E**, the user of a given one of the participant terminals may disable the speaker thereof and/or may relay the song file for playback on another device (*e.g.*, an associated further media center or the like).

**[085]** According to further embodiments, the controller **30** of the host terminal **10A** may request and/or accept unsolicited a song catalog listing from a participant terminal. The song catalog listing includes song identifications representing each of the song files on the participant terminal or song identifications for all such song files the participant wishes to make available. The host terminal **10A** may thereafter enable the host to select the song identifications of the song catalog listing the host wishes to add to the play list.

**[086]** The application programs described herein, including the song management module **40**, are illustrative of programs that implement various features according to embodiments of the present invention. It will be appreciated that other and/or additional application programs may be employed in accordance with embodiments of the present invention.

**[087]** Although **Figure 1** illustrates an exemplary hardware/software architecture that may be used in mobile terminals and/or other electronic devices for management and playback of song files, it will be understood that the present invention is not limited to such a configuration but is intended to encompass any configuration capable of carrying out operations described herein. For example, although the memory **34** is illustrated as separate from the controller **30**, the memory **34** or portions thereof may be considered as a part of the controller **30**. More generally, while particular functionalities are shown in particular blocks by way of illustration, functionalities of different blocks and/or portions thereof may be combined, divided, and/or eliminated. Moreover, the functionality of the hardware/software architecture of **Figure 1** may be implemented as a single processor system or a multi-processor system in accordance with various embodiments of the present invention.

**[088]** Many alterations and modifications may be made by those having ordinary skill in the art, given the benefit of present disclosure, without departing from the spirit and scope of the invention. Therefore, it must be understood that the illustrated embodiments have been set forth only for the purposes of example, and that

it should not be taken as limiting the invention as defined by the following claims. The following claims, therefore, are to be read to include not only the combination of elements which are literally set forth but all equivalent elements for performing substantially the same function in substantially the same way to obtain substantially the same result. The claims are thus to be understood to include what is specifically illustrated and described above, what is conceptually equivalent, and also what incorporates the essential idea of the invention.

THAT WHICH IS CLAIMED IS:

1. A mobile wireless communication terminal comprising:

a wireless communication module that is configured to communicate with other communication terminals over a wireless interface; and

a controller that is configured to establish a connection with a participant wireless communication terminal via the wireless communication module, to maintain a play list representing song files to be played, to receive a participant song identification from the participant wireless communication terminal, wherein the participant song identification corresponds to a participant song file stored on the participant wireless communication terminal, to add the participant song identification to the play list, and to thereafter execute playback of the song files represented by the play list, including retrieving the participant song file from the participant wireless communication terminal for playback.

2. The wireless communication terminal of Claim 1 wherein the controller is configured to establish a connection with a plurality of participant wireless communication terminals via the wireless communication module, to receive a plurality of participant song identifications from the plurality of participant wireless communication terminals, wherein each participant song identification corresponds to a respective participant song file stored on a respective one of the plurality of participant wireless communication terminals, to add each of the participant song identifications to the play list, and to retrieve the participant song files from each of the respective participant wireless communication terminals for playback.

3. The wireless communication terminal of Claim 1 or 2 wherein the controller is configured to retrieve and execute the participant song file from the participant wireless communication terminal as a streaming music file.

4. The wireless communication terminal of Claim 1 or 2 wherein the controller is configured to retrieve the participant song file from the participant

wireless communication terminal, to store the participant song file on the wireless communication terminal, and to thereafter execute playback of the stored participant song file.

5. The wireless communication terminal of any previous Claim wherein the controller is configured to send a playback signal to a media center for playback of the song files represented by the play list on the media center.

6. The wireless communication terminal of any previous Claim including a sound transducer and wherein the controller is configured to play the song files represented by the play list using the sound transducer.

7. The wireless communication terminal of any previous Claim wherein the controller is configured to send a playback signal to at least one participant wireless communication terminal for playback of the song files represented by the play list on the at least one participant wireless communication terminal.

8. The wireless communication terminal of any previous Claim wherein the controller is configured to receive a song catalog listing from the participant wireless communication terminal representing available song files stored on the participant wireless communication terminal, to receive user input selecting from the available song files, and to add the selected available song files to the play list.

9. The wireless communication terminal of any previous Claim wherein the controller is configured to send a listing signal to the participant wireless communication terminal representing the play list for display of the play list on the participant wireless communication terminal.

10. The wireless communication terminal of any previous Claim wherein the controller is configured to modify the play list responsive to user input.

11. The wireless communication terminal of any previous Claim wherein:

the wireless communication module is configured to communicate with other communication terminals over a direct point-to-point wireless interface; and

the controller is configured to establish the connection with the participant wireless communication terminal via the wireless communication module, receive the participant song identification from the participant wireless communication terminal, and retrieve the participant song file from the participant wireless communication terminal for playback all via the direct point-to-point wireless interface.

12. The wireless communication terminal of any previous Claim wherein the wireless communication module comprises a short range transmitter, and the controller is configured to establish the connection with the participant wireless communication terminal, receive the participant song identification from the participant wireless communication terminal, and retrieve the participant song file from the participant wireless communication terminal for playback all via the short range transmitter.

13. The wireless communication terminal of Claim 12 wherein the short range transmitter is a Bluetooth transmitter.

14. The wireless communication terminal of any previous Claim wherein the wireless communication terminal includes a cellular telephone.

15. A system for providing a song play list, the system comprising:
a host mobile wireless communication terminal;
a participant wireless communication terminal;
wherein the host wireless communication terminal includes:
a wireless communication module that is configured to communicate with other communication terminals over a wireless interface; and
a controller that is configured to establish a connection with the participant wireless communication terminal via the wireless

communication module, to maintain a play list representing song files to be played, to receive a participant song identification from the participant wireless communication terminal, wherein the participant song identification corresponds to a participant song file stored on the participant wireless communication terminal, to add the participant song identification to the play list, and to thereafter execute playback of the song files represented by the play list, including retrieving the participant song file from the participant wireless communication terminal for playback.

16. The system of Claim 15 including a plurality of participant wireless communication terminals, and wherein the controller is configured to establish a connection with each of the plurality of participant wireless communication terminals, to receive a plurality of participant song identifications from the plurality of participant wireless communication terminals, wherein each participant song identification corresponds to a respective participant song file stored on a respective one of the plurality of participant wireless communication terminals, to add each of the participant song identifications to the play list, and to retrieve the participant song files from each of the respective participant wireless communication terminals for playback.

17. A method for providing a song play list using a host wireless communication terminal, the method comprising:

establishing a wireless connection between the host wireless communication terminal and a participant wireless communication terminal;

maintaining a play list using the host wireless communication terminal, the play list representing song files to be played;

receiving at the host wireless communication terminal a participant song identification from the participant wireless communication terminal, wherein the participant song identification corresponds to a participant song file stored on the participant wireless communication terminal;

adding the participant song identification to the play list; and thereafter

executing playback of the song files represented by the play list, including retrieving the participant song file from the participant wireless communication terminal for playback.

18. A computer program product for providing a song play list using a host wireless communication terminal, the computer program product comprising:

a computer usable medium having computer usable program code embodied therein, the computer usable program code comprising:

computer usable program code configured to establish a wireless connection between the host wireless communication terminal and a participant wireless communication terminal;

computer usable program code configured to maintain a play list using the host wireless communication terminal, the play list representing song files to be played;

computer usable program code configured to receive at the host wireless communication terminal a participant song identification from the participant wireless communication terminal, wherein the participant song identification corresponds to a participant song file stored on the participant wireless communication terminal;

computer usable program code configured to add the participant song identification to the play list; and

computer usable program code configured to thereafter execute playback of the song files represented by the play list, including retrieving the participant song file from the participant wireless communication terminal for playback.

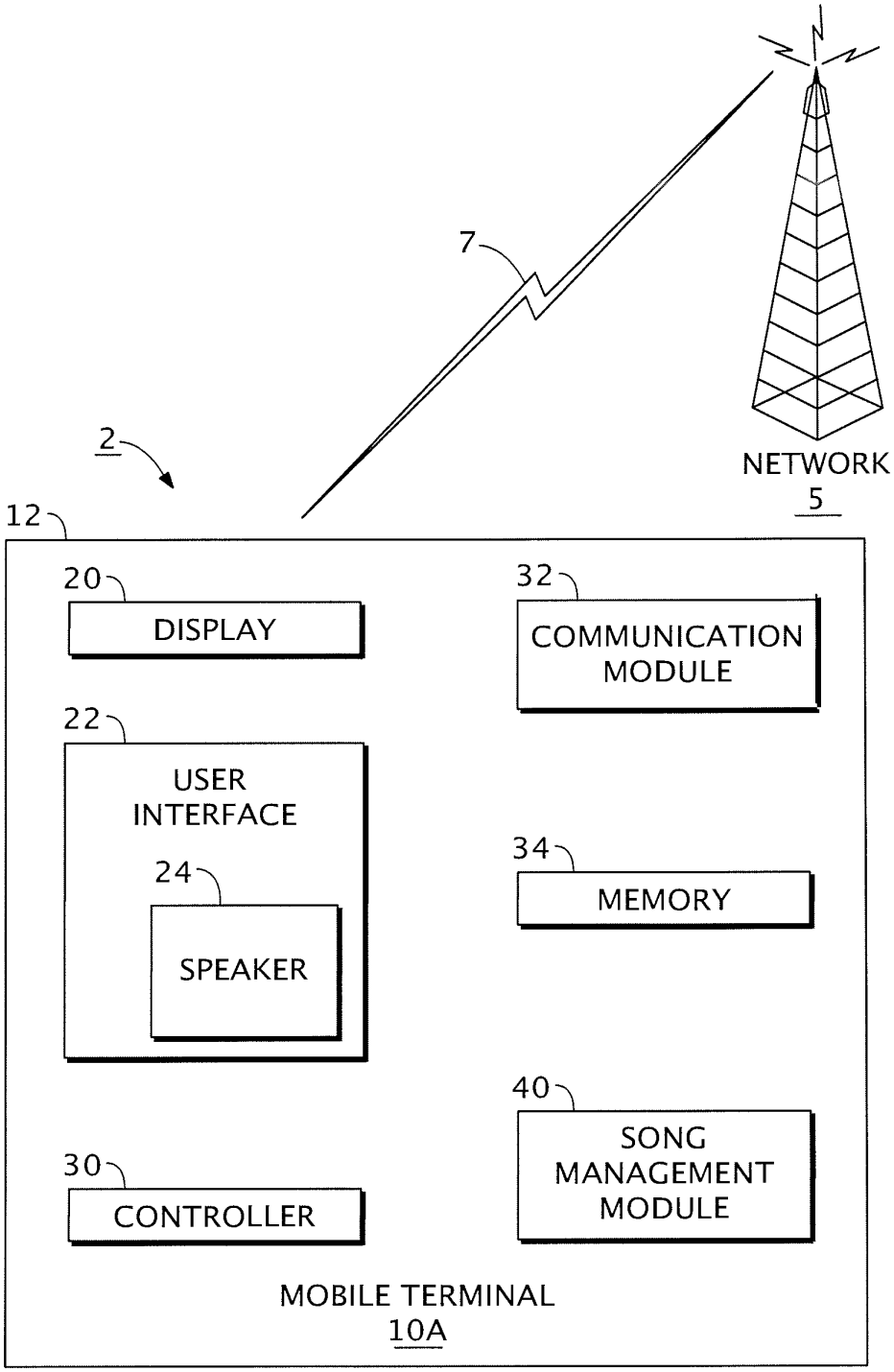

7
2
NETWORK
5
12
20
DISPLAY
32
COMMUNICATION MODULE
22
USER INTERFACE
24
SPEAKER
34
MEMORY
40
SONG MANAGEMENT MODULE
30
CONTROLLER
MOBILE TERMINAL
10A

FIG. 1

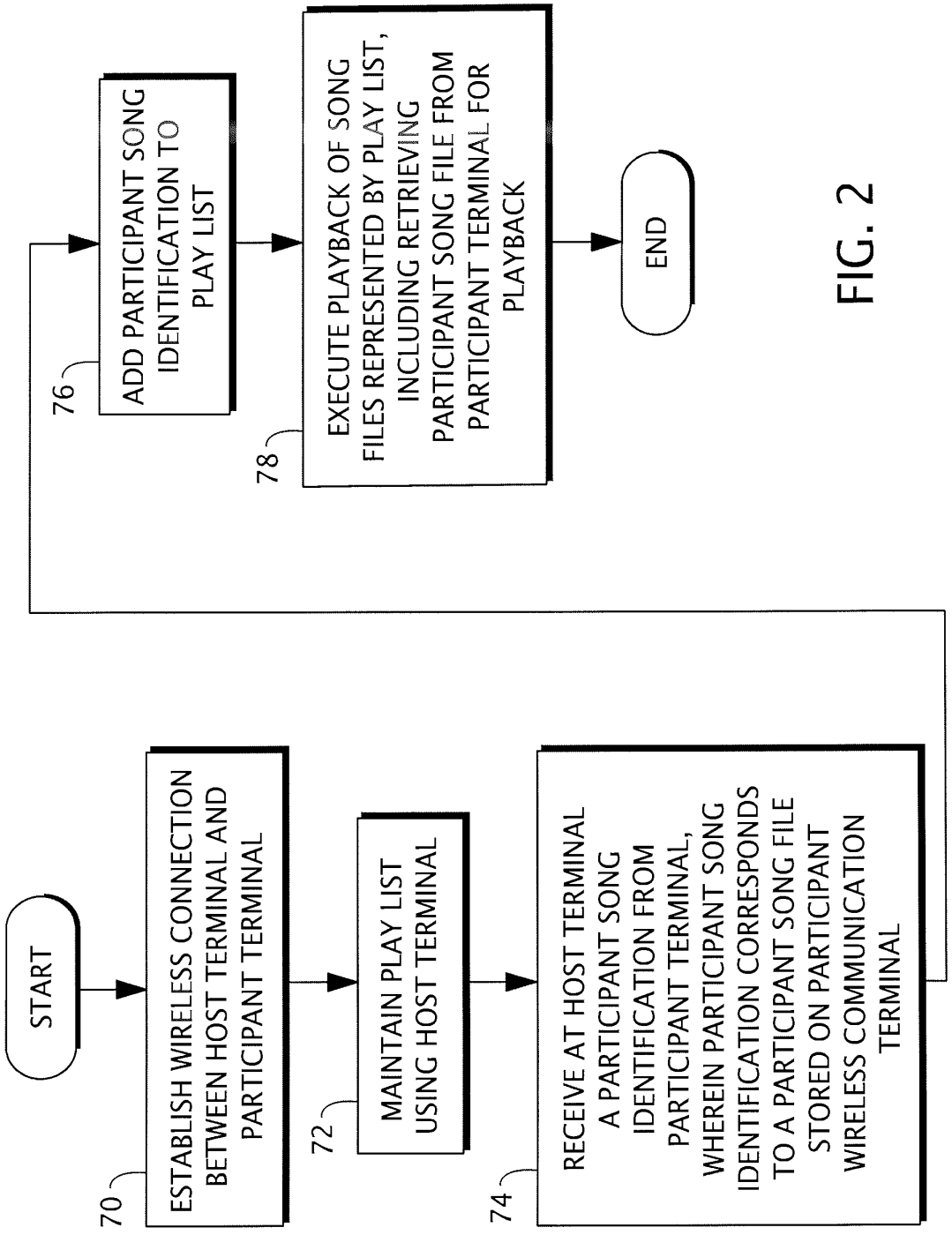

START
70
ESTABLISH WIRELESS CONNECTION BETWEEN HOST TERMINAL AND PARTICIPANT TERMINAL
72
MAINTAIN PLAY LIST USING HOST TERMINAL
74
RECEIVE AT HOST TERMINAL A PARTICIPANT SONG IDENTIFICATION FROM PARTICIPANT TERMINAL, WHEREIN PARTICIPANT SONG IDENTIFICATION CORRESPONDS TO A PARTICIPANT SONG FILE STORED ON PARTICIPANT WIRELESS COMMUNICATION TERMINAL
76
ADD PARTICIPANT SONG IDENTIFICATION TO PLAY LIST
78
EXECUTE PLAYBACK OF SONG FILES REPRESENTED BY PLAY LIST, INCLUDING RETRIEVING PARTICIPANT SONG FILE FROM PARTICIPANT TERMINAL FOR PLAYBACK
END

FIG. 2

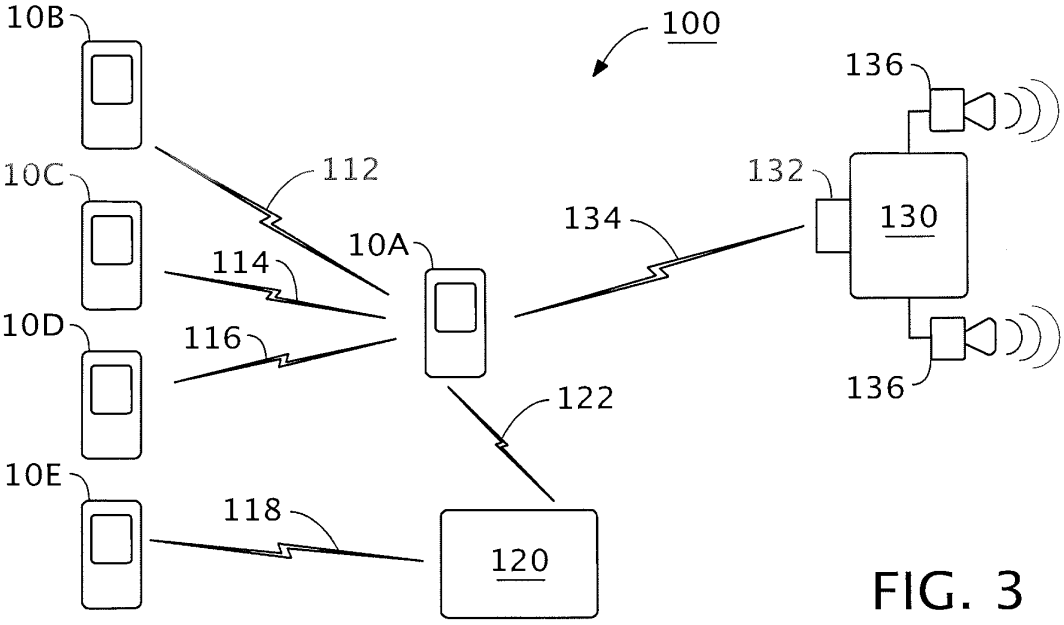

10B
100
136
10C
112
132
134
130
10A
114
10D
116
122
136
10E
118
120

FIG. 3

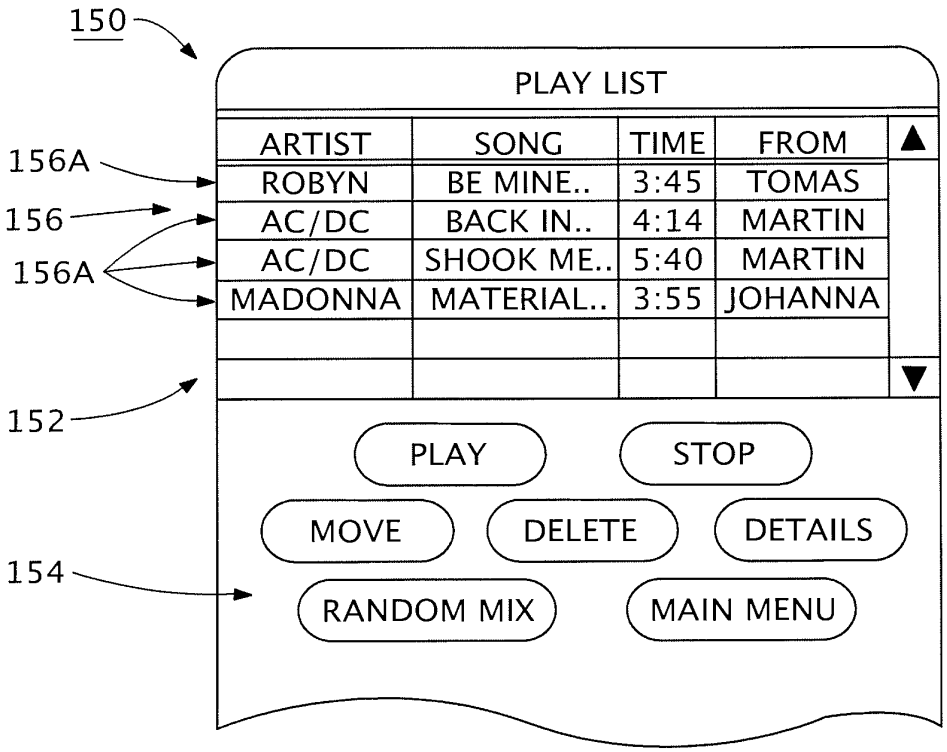

150
PLAY LIST
ARTIST
SONG
TIME
FROM
156A
ROBYN
BE MINE..
3:45
TOMAS
156
AC/DC
BACK IN..
4:14
MARTIN
156A
AC/DC
SHOOK ME..
5:40
MARTIN
MADONNA
MATERIAL..
3:55
JOHANNA
152
PLAY
STOP
MOVE
DELETE
DETAILS
154
RANDOM MIX
MAIN MENU

FIG. 4

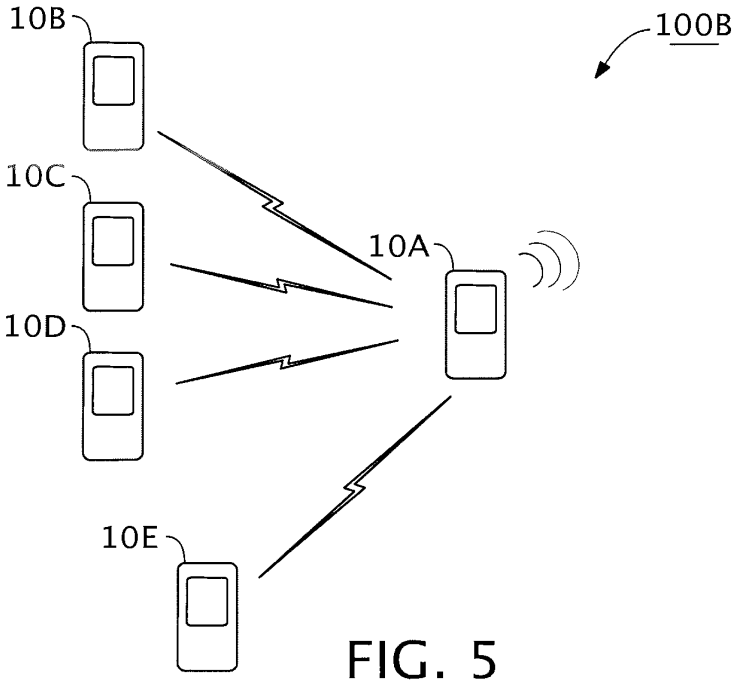



FIG. 5

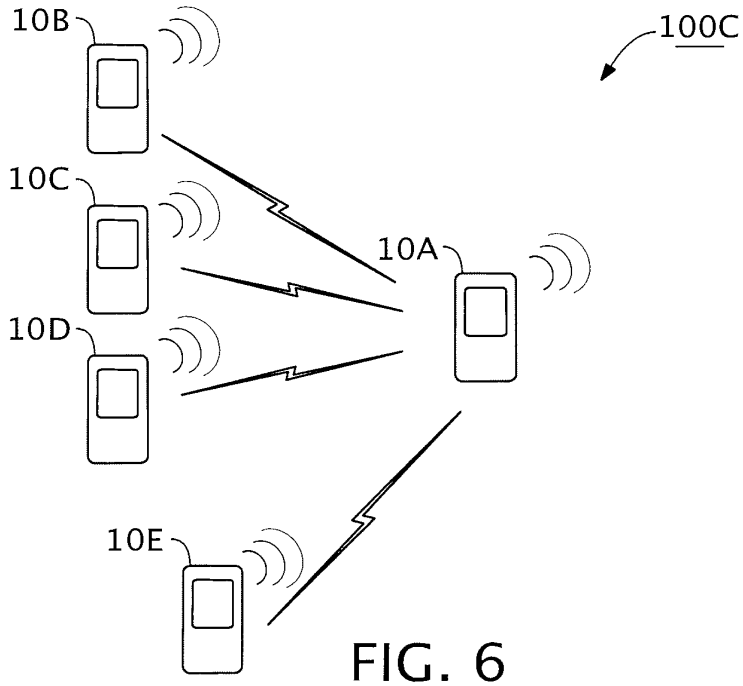



FIG. 6

# INTERNATIONAL SEARCH REPORT

International application No
PCT/EP2006/065350

A. CLASSIFICATION OF SUBJECT MATTER
INV. H04L29/08

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)
H04L

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

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)
EPO-Internal, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

| Category* | Citation of document, with indication, where appropriate, of the relevant passages | Relevant to claim No. |
|---|---|---|
| X | US 2003/037157 A1 (PESTONI FLORIAN [US] ET AL) 20 February 2003 (2003-02-20)<br>paragraph [0020] - paragraph [0021]<br>paragraph [0034] - paragraph [0040]<br>paragraph [0046]<br>paragraph [0051]<br>paragraph [0058] - paragraph [0065]<br>paragraph [0074]<br>figures 4,5 | 1-18 |
| X | WO 2005/073856 A2 (KONINKL PHILIPS ELECTRONICS NV [NL]; PHILIPS CORP [US]; GUILLORIT FABI)<br>11 August 2005 (2005-08-11)<br>page 1, line 20 - page 2, line 6<br>page 2, line 15 - line 31<br>page 3, line 9 - page 6, line 21 | 1-18 |

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

☒ See patent family annex.

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"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

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| Date of the actual completion of the international search | Date of mailing of the international search report |
|---|---|
| 16 November 2006 | 24/11/2006 |

| Name and mailing address of the ISA/ | Authorized officer |
|---|---|
| European Patent Office, P.B. 5818 Patentlaan 2<br>NL – 2280 HV Rijswijk<br>Tel. (+31-70) 340-2040, Tx. 31 651 epo nl,<br>Fax: (+31-70) 340-3016 | Homan, Peter |

Form PCT/ISA/210 (second sheet) (April 2005)

## INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No
PCT/EP2006/065350

| Patent document cited in search report | Publication date | Patent family member(s) | Publication date |
|---|---|---|---|
| US 2003037157 A1 | 20-02-2003 | NONE | |
| WO 2005073856 A2 | 11-08-2005 | EP 1711895 A2 | 18-10-2006 |

Form PCT/ISA/210 (patent family annex) (April 2005)

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国際事務局

(43) 国際公開日
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PCT

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*G06F 21/20* (2006.01)

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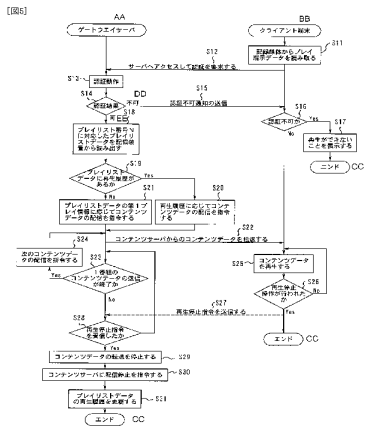
(81) 指定国 (表示のない限り、全ての種類の国内保護が可能): AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BH, BR, BW, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IS, JP, KE, KG, KM, KN, KP, KR, KZ, LA, LC, LK, LR, LS, LT, LU, LY, MA, MD, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PG, PH, PL, PT, RO, RS, RU, SC, SD, SE, SG, SK, SL, SM, SV, SY, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW.

(84) 指定国 (表示のない限り、全ての種類の広域保護が可能): ARIPO (BW, GH, GM, KE, LS, MW, MZ, NA, SD, SL, SZ, TZ, UG, ZM, ZW), ユーラシア (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), ヨーロッパ (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HU, IE, IS, IT, LT, LU, LV, MC, MT, NL, PL, PT, RO, SE, SI, SK,

*[続葉有]*

**(54) Title:** CONTENT REPRODUCING SYSTEM AND ITS CONTROL METHOD

**(54) 発明の名称:** コンテンツ再生システム及びその制御方法




AA GATEWAY SERVER
BB CLIENT SERVER
S11 READ PLAY INSTRUCTION DATA FROM RECORDING MEDIUM
S12 ACCESS SERVER AND REQUEST FOR AUTHENTICATION
S13 AUTHENTICATION OPERATION
S14 AUTHENTICATION RESULT
DD UNSUCCESSFUL
EE SUCCESSFUL
S15 TRANSMIT UNSUCCESSFUL AUTHENTICATION NOTIFICATION
S16 UNSUCCESSFUL AUTHENTICATION?
S17 DISPLAY THAT REPRODUCTION IS IMPOSSIBLE
CC END
S18 READ PLAY LIST DATA CORRESPONDING TO PLAY LIST NUMBER N FROM STORAGE DEVICE
S19 PLAY LIST DATA INCLUDE REPRODUCTION HISTORY?
S20 INSTRUCT TO DELIVER CONTENT DATA ACCORDING TO REPRODUCTION HISTORY
S21 INSTRUCT TO DELIVER CONTENT DATA ACCORDING TO FIRST PLAY INFORMATION OF PLAY LIST DATA
S22 TRANSFER CONTENT DATA FROM CONTENT SERVER
S23 CONTENT DATA TRANSMISSION OF FIRST PROGRAM COMPLETED?
S24 INSTRUCT TO DELIVER NEXT CONTENT DATA
S25 REPRODUCE CONTENT DATA
S26 REPRODUCTION STOP OPERATION PERFORMED?
S27 TRANSMIT REPRODUCTION STOP INSTRUCTION
S28 REPRODUCTION STOP INSTRUCTION RECEIVED?
S29 STOP TRANSFERRING OF CONTENT DATA
S30 INSTRUCT CONTENT SERVER TO STOP DELIVERY
S31 UPDATE REPRODUCTION HISTORY OF PLAY LIST DATA

**(57) Abstract:** Play list data is created that indicates, for each program, the stored position and reproduction order of the content data stored in a server device, and is stored into a storage means. Play instruction data including play list specification information for specifying the play list data is recorded onto a recording medium. A terminal reads out the play instruction data on the recording medium, according to which the terminal transmits the information for specifying the play list data to the server device and receives content data delivered from the server device.

**(57) 要約:** サーバ装置において蓄積しているコンテンツデータの番組毎の蓄積位置及び再生順番を示すプレイリストデータを作成して記憶手段に記憶し、そのプレイリストデータを特定するプレイリスト特定情報を含むプレイ指示データを記録媒体に記録し、端末において記録媒体のプレイ指示データを読み出してそれに応じてサーバ装置にプレイリストデータ特定する情報を送信してサーバ装置からコンテンツデータの配信を受ける。

WO 2008/114389 A1

TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

添付公開書類:
— 国際調査報告書

# 明 細 書

## コンテンツ再生システム及びその制御方法

## 技術分野

[0001] 本発明は、コンテンツデータをネットワークを介して端末に配信してそこで再生するシステム及びその制御方法に関する。

## 背景技術

[0002] インターネット等のネットワークを利用して映像や音声を示すコンテンツデータを端末に配信するシステムがある。このようなシステムにおいては、コンテンツデータを蓄積したデータベースを有するサーバ装置と、少なくとも1つの端末とがネットワークを介して接続されている(例えば、特許文献1参照)。端末からサーバ装置にアクセスすると、サーバ装置では配信できるコンテンツを番組単位でリスト表示するためのメニューデータが端末に送信される。端末ではメニューデータに応じてリスト表示がされ、そのリスト表示からユーザが所望の番組を選択することによりサーバ装置にコンテンツ選択指令が届き、サーバ装置ではそのコンテンツ選択指令に対応したコンテンツデータをデータベースから読み出してストリーミング配信することが行われる。端末では配信されたコンテンツデータの再生が行われ、それによりユーザは映像や音声を得ることができる。

特許文献1:特開2003－69956号公報

## 発明の開示

## 発明が解決しようとする課題

[0003] しかしながら、上記したような従来のコンテンツ再生システムにおいては、コンテンツデータがストリーミング配信されて映像や音声が実際に端末で得られるまでには通常、端末のユーザは煩雑な操作を必要とする。例えば、サーバ装置の選択操作、パスワードを入力を含むユーザ認証操作、コンテンツ選択操作が必要とである。よって、年寄りや子供には操作が難しいためコンテンツデータの配信により映像や音声を容易に楽しむことはできないという問題がある。

[0004] 本発明が解決しようとする課題には、上記の欠点が一例として挙げられ、端末のユ

ーザが極めて簡単な操作でコンテンツデータの配信を受けて映像や音声を容易に楽しむことができるコンテンツ再生システム及びその制御方法を提供することが本発明の目的である。

課題を解決するための手段

[0005] 請求項1に係る発明のコンテンツ再生システムは、コンテンツデータを番組単位で蓄積した少なくとも1つのデータベースを有するコンテンツ配信サーバ装置と、コンテンツデータの再生機能を有する少なくとも1つの端末とがネットワークを介して接続されたコンテンツ再生システムであって、コンテンツ配信サーバ装置は、前記データベースに蓄積されたコンテンツデータの番組毎の蓄積位置及び再生順番を示すプレイリストデータを作成して記憶手段に記憶して管理する管理手段と、前記プレイリストデータを特定するプレイリスト特定情報を含むプレイ指示データを作成するデータ作成手段と、前記プレイ指示データを記録媒体に記録する記録手段と、を備え、前記端末は、前記記録媒体の前記プレイ指示データを読み取る読取手段と、前記読取手段によって読み取られたプレイ指示データ中の少なくともプレイリスト特定情報を前記管理手段に送信する送信手段と、を備え、前記管理手段は、前記送信手段からの前記プレイリスト特定情報に対応した前記プレイリストデータを前記記憶手段から読み出し、その読み出した前記プレイリストデータに示された蓄積位置及び再生順番で番組毎に前記コンテンツデータを前記データベースから読み出してそれを前記端末に前記ネットワークを介して転送し、前記端末は前記管理手段によって転送された前記コンテンツデータを受信して再生すること特徴としている。

[0006] 請求項6に係る発明のコンテンツ再生システムの制御方法は、コンテンツデータを番組単位で蓄積した少なくとも1つのデータベースを有するコンテンツ配信サーバ装置と、コンテンツデータの再生機能を有する少なくとも1つの端末とがネットワークを介して接続されたコンテンツ再生システムの制御方法であって、前記データベースに蓄積されたコンテンツデータの番組毎の蓄積位置及び再生順番を示すプレイリストデータを作成して記憶手段に記憶して管理する管理ステップと、前記プレイリストデータを特定するプレイリスト特定情報を含むプレイ指示データを作成するステップと、前記プレイ指示データを記録媒体に記録するステップと、前記記録媒体の前記プレイ指

示データを前記端末にて読み取る読取ステップと、前記読取ステップにて読み取られたプレイ指示データ中の少なくともプレイリスト特定情報を前記コンテンツ配信サーバ装置に送信する送信ステップと、を備え、前記管理ステップでは、前記プレイリスト特定情報に対応した前記プレイリストデータを前記記憶手段から読み出し、その読み出した前記プレイリストデータに示された蓄積位置及び再生順番で番組毎に前記コンテンツデータを前記データベースから読み出してそれを前記端末に前記ネットワークを介して転送し、前記端末ではその転送された前記コンテンツデータを受信して再生すること特徴としている。

## 図面の簡単な説明

[0007] [図1]本発明によるコンテンツ再生システムの構成を示すブロック図である。

[図2]コンテンツリストデータを示す図である。

[図3]プレイリスト登録動作を示すフローチャートである。

[図4]プレイリスト作成動作を示すフローチャートである。

[図5]クライアント端末からの再生動作を示すフローチャートである。

[図6]プレイリスト再編集動作を示すフローチャートである。

## 符号の説明

[0008] 1 コンテンツ配信サーバ装置

2 クライアント端末

11, 12 コンテンツサーバ

14 ゲートウエイサーバ14

15 LAN回線

16 記録媒体

## 発明を実施するための最良の形態

[0009] 請求項1に係る発明のコンテンツ再生システム及び請求項6に係る発明のコンテンツ再生システムの制御方法においては、コンテンツ配信サーバ装置では、データベースに蓄積されたコンテンツデータの番組毎の蓄積位置及び再生順番を示すプレイリストデータが作成されて記憶手段に保存され、そのプレイリストデータを特定するためのプレイ指示データが記録媒体に記録される。端末では、記録媒体のプレイ指示

データを読み取ってそのプレイ指示データ中の少なくともプレイリスト特定情報をコンテンツ配信サーバ装置に送信することが行われる。コンテンツ配信サーバ装置では、端末から受信したプレイリスト特定情報に対応したプレイリストデータが記憶手段から読み出され、そのプレイリストデータに示された蓄積位置及び再生順番で番組毎にコンテンツデータがデータベースから読み出されて端末に転送される。端末は転送されたコンテンツデータを受信して再生する。

[0010] よって、端末のユーザは記録媒体をセットするだけでコンテンツデータの配信を受けることができるので、映像や音声を容易に楽しむことができる。

## 実施例

[0011] 以下、本発明の実施例を図面を参照しつつ詳細に説明する。

[0012] 図1は本発明によるコンテンツ再生システムを示している。このコンテンツ再生システムは、コンテンツ配信サーバ装置1とクライアント端末2とを備えている。コンテンツ配信サーバ装置1とクライアント端末2とはインターネット等のネットワーク20によって接続されている。

[0013] コンテンツ配信サーバ装置1は第1及び第2コンテンツサーバ11，12、ネットワーク機能付き再生装置13及びゲートウエイサーバ14からなる。コンテンツサーバ11，12、再生装置13及びゲートウエイサーバ14はLAN回線15で互いに接続されている。コンテンツ配信サーバ装置1は一般家庭のホームサーバ装置或いは、オフィスの業務装置であっても良い。

[0014] 第1及び第2コンテンツサーバ11，12各々は、LAN回線15に接続可能なPC（パーソナルコンピュータ）やハードディスクレコーダからなり、コンテンツデータのデータベース11a，12aを備え、コンテンツ配信サーバ装置1内の再生装置13及びゲートウエイサーバ14にコンテンツデータを直接配信する機能を有している。また、クライアント端末2等の外部の端末からのデータ要求に応答してコンテンツデータをゲートウエイサーバ14を介して配信する機能を有している。コンテンツデータとはテレビの放送番組等の番組単位の映像データ及び音声データを含むデータであり、例えば、MPEG2形式で構成されている。データベースにおいてはコンテンツデータは番組毎のファイルとして存在する。

[0015] また、第1及び第2コンテンツサーバ11，12各々は配信可能なコンテンツデータについて番組名等の番組情報を示すコンテンツリストデータを有している。コンテンツリストデータは図2(a)及び(b)に示すように、少なくともコンテンツId、番組名Title、記録日時Date、記録時間長Duration等のを示すデータである。コンテンツIdはコンテンツデータの格納アドレス及びファイル名からなる。また、リストデータは新たなコンテンツデータがデータベースに加えられる毎にゲートウエイサーバ14に供給されるか、ゲートウエイサーバ14が定期的に第1及び第2コンテンツサーバ11，12各々にリストデータが更新されたかどうか問い合わせ、更新されている場合にリストデータの供給を受ける。

[0016] ゲートウエイサーバ14はコンテンツデータを送信先に転送する。コンテンツサーバ11又は12からクライアント端末2に向けて送信されたコンテンツデータはLAN回線15、ゲートウエイサーバ14、ネットワーク20を介してクライアント端末2に伝送される。

[0017] また、ゲートウエイサーバ14においては、ディスプレイ14aの他にキーボードやマウス等の操作部14bが備えられ、そのディスプレイ14aに表示されるメニュー映像に従ってユーザが操作部14bを直接操作してプレイリストを作成することができる。プレイリストは第1及び第2コンテンツサーバ11，12が備えている上記のコンテンツリストデータに応じて作成され、サーバの固有識別子、プレイリスト番号、コンテンツの格納位置（アドレス及びファイル名を含む）、番組名、記録日時、記録時間長、デジタル証明書を示す。作成されたプレイリストはゲートウエイサーバ14内のハードディスク装置等の記憶装置14cにプレイリストデータとして保存される。

[0018] ゲートウエイサーバ14はプレイリストデータの一部のデータを記録媒体16に記録するための記録装置14dを備えている。プレイリストデータの一部のデータとは少なくともサーバの固有識別子、プレイリスト番号及びデジタル証明書からなるプレイ指示データである。プレイ指示データのプレイリスト番号がプレイリスト特定情報である。記録媒体としてはこの実施例ではCD－R、DVD－R、DVD－RW等の書込可能なディスクが用いられるが、持ち運ぶことができるUSBメモリ等の半導体メモリでも良い。更に、Blutoothや赤外線通信等により外部とデータ通信が可能な携帯電話機を用いて携帯電話機内のメモリにプレイ指示データを書き込んでも良い。

[0019] 再生装置13は第1及び第2コンテンツサーバ11，12各々に記録されたコンテンツデータを選択的に再生することができ、また記録媒体16に書き込まれたプレイリストデータを読み取ることができる。

[0020] クライアント端末2はネットワーク20を介してゲートウエイサーバ14等の他の通信機器と通信する機能と、受信したコンテンツデータを再生して映像表示しかつ音声出力する機能とを有するPCで良い。また、クライアント端末2は再生装置13と同様の、通信機能を有する再生装置でも良い。クライアント端末2は記録媒体16に書き込まれたプレイ指示データを読み取るためにドライブ装置21を備えている。ドライブ装置21に記録媒体16が挿入されると、それによって自動的に記録媒体16に書き込まれたプレイ指示データを読み取って後述する通信再生動作を行うことができる。なお、PC以外のクライアント端末2としては、専用端末、携帯電話機、カーナビゲーション装置、携帯ゲーム端末が利用可能である。

[0021] 次に、かかる構成のコンテンツ再生システムのゲートウエイサーバ14において行われるプレイリスト登録動作について具体的に説明する。プレイリスト登録動作は上記したように、プレイリストを作成してそれを記憶装置14cに保存する動作である。

[0022] プレイリスト登録動作は、ユーザが新規のプレイリスト登録を上記のメニュー映像から選択操作することにより開始される。ゲートウエイサーバ14のプロセッサ14eは、プレイリスト登録動作では図3に示すように、先ず、新規プレイリスト番号Nを作成し（ステップS1）、第1パスワード及び第2パスワードを設定する（ステップS2，S3）。新規プレイリスト番号Nは予め定められた順番の番号であり、プレイリストの登録のために付けられる。第1パスワードはプレイリストを新規登録後に再編集する際に必要なパスワードである。第2パスワードは遠隔アクセスの際、例えば、クライアント端末2からゲートウエイサーバ14にアクセスする際に必要となるパスワードである。第1パスワード及び第2パスワードとしてはユーザによる操作部14bの操作によって任意の英数字を指定しても良い。或いは、プロセッサ14eによりランダムにそれらパスワードを生成してそれをユーザに対して表示しても良い。ただし、第1パスワード及び第2パスワード各々の設定は必須ではなく、いずれか一方或いは両方を省略しても良い。

[0023] 次に、ゲートウエイサーバ14のプロセッサ14eは、プレイリスト名を設定する（ステッ

プS4)。プレイリスト名としては初期名としてプレイリスト番号Nに基づいて例えば、「PlayList N:作成日時」がユーザに対して示されるが、ユーザが操作部14bを操作して任意の文字を入力することにより指定することが可能である。

[0024] そして、サーバの固有識別子、プレイリスト番号N、第1パスワード、第2パスワード及び作成日時に基づいてデジタル証明書を作成する(ステップS5)。サーバの固有識別子はゲートウエイサーバ14のネットワーク20上のアドレス位置を示し、例えば、IPアドレスである。プレイリスト番号N、第1及び第2パスワードはステップS1～S3で決定されたものである。デジタル証明書は、クライアント端末2等の遠隔地の端末でプレイリストを用いる際に正規の登録プレイリストであることを証明するために用いられる。

[0025] デジタル証明書の作成後、ゲートウエイサーバ14のプロセッサ14eは、プレイリスト作成を行う(ステップS6)。

[0026] プレイリスト作成では、図4に示すように、先ず、利用可能なコンテンツサーバの名称がディスプレイ14aに選択メニューとして表示される(ステップS61)。ユーザはその選択メニューに従って操作部14bの操作によってコンテンツサーバを選択する。この実施例では第1及び第2コンテンツサーバ11，12の名称、例えば、コンテンツ1、コンテンツ2の如くが選択メニューとして表示される。ユーザがこの選択メニューから選択操作を行うことにより、コンテンツサーバが選択される。実際にはコンテンツ1、コンテンツ2のような表示ではなく、レコーダの機種名、PCのネットワーク配信ソフトのアプリケーション名などが表示されても良い。また、ユーザはどのサーバにどのコンテンツがあるのかか、把握していない状況もありえるので、全てのコンテンツサーバのコンテンツを一覧にして、コンテンツの付属情報として、どのコンテンツサーバ内のコンテンツであるのかを表示するなどして、ステップS61と次のステップS62を1ステップで実現する方法でも良い。更に、コンテンツ選択の補助として、ソート機能を有しても良い。

[0027] そして、その選択されたコンテンツサーバのコンテンツがディスプレイ14aにリスト表示される(ステップS62)。リスト表示は第1及び第2コンテンツサーバ11，12各々のコンテンツリストデータに応じて行われる。コンテンツリストデータにはコンテンツサーバが配信可能なコンテンツの番組名が示されているので、それが読み出されて番組リストとして表示される。ユーザは操作部14bの操作によって番組リストから1つの番組を

任意に選択することができる。1つの番組が選択されると、その選択番組についてのリストデータ内の番組情報が読み出されて、それがプレイリストデータにプレイ情報として加えられ(ステップS63)、そのプレイリストデータの現在の内容がディスプレイ14aに表示される(ステップS64)。プレイリストデータにおいては、第1プレイ情報、第2プレイ情報、……のように選択順にブロックが形成される。プレイリストデータの現在の内容表示ではユーザによって選択された番組がその番組名で選択順に示される。なお、選択順が再生順でもある。再生動作については後述するが、第1プレイ情報に対応した番組のコンテンツデータが最初に再生されることになる。

[0028] ステップS64の実行後、ユーザが更なるコンテンツのプレイリストへの追加を指示したか否かを判別する(ステップS65)。操作部14bの操作によって更なるコンテンツのプレイリストへの追加が指示された場合には、ステップS61が再度実行される。一方、更なるコンテンツのプレイリストへの追加が指示されていない場合には、ユーザがプレイリスト作成の終了を指示したか否かを判別する(ステップS66)。操作部14bの操作によって終了が指示された場合にはプレイリスト作成が終了したと判断される。

[0029] プレイリスト作成の作成後、ゲートウエイサーバ14のプロセッサ14eは、その時点におけるプレイリストデータを記憶装置14cに保存して管理する(ステップS7)。その保存されるプレイリストデータには上記のサーバの固有識別子、プレイリスト番号N、第1パスワード、第2パスワード、作成日時及びデジタル証明書が付加される。第1パスワード及び第2パスワードについてはステップS2，3で一方又は双方が省略された場合には省略されたパスワードはプレイリストデータに付加されない。そして、記録媒体16にプレイリストデータのうちの少なくともサーバの固有識別子、プレイリスト番号N及びデジタル証明書からなるプレイ指示データの書き込みを記録装置14dに対して指令する(ステップS8)。その書き込み指令に応じて記録装置14dは記録媒体16にプレイ指示データを書き込む。このようなプレイ指示データが書き込まれた記録媒体16をユーザは記録装置14dから取り出して持ち運ぶことができる。

[0030] なお、プレイリストデータには再生履歴が含まれる。再生履歴は前回の再生コンテンツ(コンテンツId)の再生中断位置情報である。また、クライアント端末2からゲートウエイサーバ14にアクセスする際に第2パスワードの入力を要求する場合には、プレイ

指示データには第2パスワードが含まれる。ただし、第2パスワードについては、プレイ指示データを記録した記録媒体が盗まれたり、紛失した場合に第2パスワードが無意味なものになってしまう可能性があるので、実際には記録媒体には第2パスワードをプレイ指示データと共に記録せず、アクセスの際にはデジタル証明書と入力されたパスワードからなる別の証明書を作り、それによってゲートウエイにアクセス認証をする形の方が良い。

[0031] 次に、この記録媒体16を用いてクライアント端末2でコンテンツ再生する場合の動作について説明する。なお、クライアント端末2を操作するユーザはゲートウエイサーバ14においてプレイリスト登録を操作したユーザと同一でも良いし、別のユーザでも良い。

[0032] クライアント端末2のドライブ装置21に記録媒体16がセットされると、コンテンツ再生動作が開始される。図5に示すように、コンテンツ再生動作ではクライアント端末2のプロセッサは記録媒体16に記録されたプレイ指示データをドライブ装置21を介して読み取り(ステップS11)、サーバへのアクセスを行って認証を要求する(ステップS12)。ステップS11ではプレイ指示データに含まれているサーバの固有識別子、プレイリスト番号N及びデジタル証明書が得られる。ステップS12ではその得られた固有識別子で示されるアドレス位置にアクセスが行われる。この実施例ではクライアント端末2からゲートウエイサーバ14へのアクセスが行われて通信が可能になるとする。認証要求ではプレイリスト番号N及びデジタル証明書が送信される。

[0033] ゲートウエイサーバ14は認証要求を受信すると、ゲートウエイサーバ14のプロセッサ14eは認証要求に含まれるプレイリスト番号N及びデジタル証明書に応じて認証動作を行う(ステップS13)。認証動作ではデジタル証明書が正規のものであるかが判別され、その判別ではプレイリスト番号に対応して記憶装置14cに保存されているデジタル証明書が参照される。認証動作の結果が判別され(ステップS14)、認証不可ならば、認証不可通知がクライアント端末2に送信される(ステップS15)。

[0034] ゲートウエイサーバ14が認証動作するのではなく、専用の認証サーバが認証動作を行う形態でも勿論良い。その場合は、クライアント端末2はまず、その認証サーバにアクセスし、認証サーバによってデジタル証明書が認証されると、ゲートウエイサーバ

14のアドレスがクライアント端末2に通知され、それから、クライアント端末2がゲートウエイサーバ14にアクセスすることになる。

[0035] クライアント端末2のプロセッサは認証不可通知を受信すると(ステップS16のYes)、そのユーザにコンテンツ再生ができないことをディスプレイに表示する(ステップS17)。ステップS17ではサーバが認証しなかったことを表示しても良い。

[0036] ゲートウエイサーバ14のプロセッサ14eは、認証動作の結果が認証可ならば、プレイリスト番号Nに対応したプレイリストデータを記憶装置14cから読み出す(ステップS18)。プレイリストデータに再生履歴があるか否かを判別する(ステップS19)。再生履歴がある場合には、その再生履歴、すなわちコンテンツId及び再生中断位置情報に応じてコンテンツデータの配信を指令する(ステップS20)。再生履歴がない場合には、プレイリストデータの第1プレイ情報によって指定されるコンテンツデータの配信を指令する(ステップS21)。

[0037] ステップS20又はS21の指令に応じて第1コンテンツサーバ11又は第2コンテンツサーバ12は指定のコンテンツデータを読み出してゲートウエイサーバ14に供給する。ゲートウエイサーバ14は第1コンテンツサーバ11又は第2コンテンツサーバ12からのコンテンツデータをクライアント端末2に向けて転送する(ステップS22)。コンテンツデータはいわゆるストリーミングデータとしてクライアント端末2に送信される。

[0038] ゲートウエイサーバ14のプロセッサ14eは、1番組についてのコンテンツデータの読み出しが終了すると(ステップS23のYes)、プレイリストデータの次のプレイ情報によって指定されるコンテンツデータの読み出しを指令する(ステップS24)。ステップS24の指令に応じて第1コンテンツサーバ11又は第2コンテンツサーバ12は指定のコンテンツデータを読み出してゲートウエイサーバ14に供給する。そして、ステップS22によってゲートウエイサーバ14は第1コンテンツサーバ11又は第2コンテンツサーバ12からのコンテンツデータをクライアント端末2に向けて転送する。

[0039] クライアント端末2のプロセッサは、コンテンツデータを受信すると、コンテンツデータを再生して映像信号及び音声信号を生成する(ステップS25)。その映像信号に応じてクライアント端末2のディスプレイに映像が表示され、その音声信号に応じてクライアント端末2のスピーカから音響出力が得られる。

[0040] クライアント端末2においては、コンテンツ再生動作中にユーザによって再生停止操作が行われたか否かが判別される(ステップS26)。再生停止操作が行われた場合には、再生停止指令がゲートウエイサーバ14に送信される(ステップS27)。

[0041] ゲートウエイサーバ14のプロセッサ14eは、ステップS22にてコンテンツデータの転送開始後、クライアント端末2からの再生停止指令を受信したか否かを判別する(ステップS28)。再生停止指令を受信した場合には、コンテンツデータのクライアント端末2に向けての転送を停止し(ステップS29)、コンテンツデータを配信中の第1コンテンツサーバ11又は第2コンテンツサーバ12に配信停止を指令し(ステップS30)、記憶装置14c内のプレイリスト番号Nに対応したプレイリストデータの再生履歴を更新する(ステップS31)。すなわち、プレイリストデータの再生履歴更新ではコンテンツデータの転送停止した時点における当該コンテンツデータに応じてコンテンツId及び再生中断位置情報を書き換えることが行われる。

[0042] なお、クライアント端末2のドライブ装置21に記録媒体16がセットされると、直ちにユーザに対して上記した第2パスワードの入力を要求しても良い。ユーザによる入力操作によって入力されたパスワードがステップS3で設定された第2パスワードに等しい場合にのみコンテンツ再生動作が開始される。

[0043] ゲートウエイサーバ14において、ユーザがプレイリスト再編集を上記のメニュー映像から選択操作すると、プレイリスト再編集動作が開始される。

[0044] プレイリスト再編集動作においては、プロセッサ14eはユーザに対してプレイリスト番号Nの入力を要求する(ステップS41)。これはディスプレイ14aにプレイリスト番号Nの入力要求又は選択が表示される。プレイリスト番号Nが入力されると、プレイリスト番号Nに対応したプレイリストデータを記憶装置14cから読み出す(ステップS42)。読み出したプレイリストデータに第1パスワードが含まれているか否かを判別する(ステップS43)。プレイリストデータに第1パスワードが含まれている場合には、第1パスワードの入力をユーザに対して要求する(ステップS44)。ユーザの操作部14bの入力操作によってパスワードが入力されると、その入力パスワードが第1パスワードと一致するか否かを判別する(ステップS45)。ステップS45にてパスワードが一致すると判別すると、プレイリスト番号Nのプレイリストデータの現在の内容をディスプレイ14aに表

示する(ステップS46)。プレイリストデータの現在の内容表示ではユーザによって選択された番組がその番組名で選択順に示される。

[0045] ステップS43の判別においてプレイリストデータに第1パスワードが含まれていない場合には、ゲートウエイサーバ14のプロセッサ14eは直ちにステップS46を実行する。

[0046] ステップS46の実行後、例えば、編集開始をユーザが指令する操作を行うと上記のステップS6のプレイリスト作成動作(ステップS61～S66)が行われる。なお、プレイリスト再編集動作では番組を追加するだけでなく、既に設定した番組を変更したり、再生順を変更しても良い。

[0047] プレイリスト再編集は、プレイリスト指示データを記録した記録媒体を用いて、クライアント端末2で再生動作を行った後でも可能であり、その場合は、記録媒体のデータを更新することなく、再生するコンテンツの追加や、削除が可能となる。また、記録媒体の紛失や盗難により、正規でないユーザがゲートウエイサーバ14にアクセスする恐れが生じた場合には、当該プレイリストを削除することにより、無効化することができる。

[0048] このように、本発明によるコンテンツ再生システムにおいては、番組単位のコンテンツデータの再生順を示すプレイリストデータが作成された後、そのプレイリストデータを指定するプレイ指示データが記録媒体16に記録されると、その記録媒体16をクライアント端末2のドライブ装置21にセットするだけでプレイリストデータに従ってコンテンツデータの再生動作が行われる。クライアント端末2のユーザの操作としては記録媒体16をドライブ装置21に挿入或いは直接セットするだけで良いので、難しい操作をしなくてもコンテンツサーバに保存されたコンテンツデータのストリーミング再生が可能となり、そのユーザは番組のデータ再生映像及び音声を楽しむことができる。よって、本発明による再生システムは年寄りや子供のように難しい操作ができない端末ユーザには特に好適である。

# 請求の範囲

[1] コンテンツデータを番組単位で蓄積した少なくとも1つのデータベースを有するコンテンツ配信サーバ装置と、コンテンツデータの再生機能を有する少なくとも1つの端末とがネットワークを介して接続されたコンテンツ再生システムであって、

コンテンツ配信サーバ装置は、前記データベースに蓄積されたコンテンツデータの番組毎の蓄積位置及び再生順番を示すプレイリストデータを作成して記憶手段に記憶して管理する管理手段と、

前記プレイリストデータを特定するプレイリスト特定情報を含むプレイ指示データを作成するデータ作成手段と、

前記プレイ指示データを記録媒体に記録する記録手段と、を備え、

前記端末は、前記記録媒体の前記プレイ指示データを読み取る読取手段と、

前記読取手段によって読み取られたプレイ指示データ中の少なくともプレイリスト特定情報を前記管理手段に送信する送信手段と、を備え、

前記管理手段は、前記送信手段からの前記プレイリスト特定情報に対応した前記プレイリストデータを前記記憶手段から読み出し、その読み出した前記プレイリストデータに示された蓄積位置及び再生順番で番組毎に前記コンテンツデータを前記データベースから読み出してそれを前記端末に前記ネットワークを介して転送し、前記端末は前記管理手段によって転送された前記コンテンツデータを受信して再生すること特徴とするコンテンツ再生システム。

[2] 前記端末は、前記コンテンツデータの再生中に操作に応じて再生停止指令を発生してその再生停止指令を前記管理手段に送信する手段を有し、

前記管理手段は、前記再生停止指令に応答して前記端末への前記コンテンツデータの転送を停止し、その転送停止のコンテンツデータについてのコンテンツ中断位置情報を示す再生履歴を前記プレイリストデータに加えて前記記憶手段に記憶する手段と、

前記プレイリストデータを前記記憶手段から読み出したときには前記プレイリストデータ中に前記再生履歴があるか否かを判別する手段と、を有し、

前記再生履歴がある場合には前記再生履歴に示される前記コンテンツ中断位置情

報に応じて前記コンテンツデータを前記データベースから読み出してそれを前記端末に前記ネットワークを介して転送することを特徴とする請求項1記載のコンテンツ再生システム。

[3] 前記コンテンツ配信サーバ装置は前記1つのデータベースを含む複数のデータベースを有し、

前記プレイリストデータは前記複数のデータベース各々に蓄積されたコンテンツデータの番組毎の蓄積位置及び再生順番を示すこと特徴とする請求項1記載のコンテンツ再生システム。

[4] 前記プレイ指示データは前記プレイリスト特定情報の他に、前記管理手段の固有識別子と、前記管理手段が認証用のデジタル証明書とを含み、

前記送信手段は、前記読取手段によって読み取られたプレイ指示データ中の前記プレイリスト特定情報及び前記デジタル証明書を、前記管理手段の固有識別子によって示される前記管理手段のアドレスに向けて送信し、

前記管理手段は、前記送信手段からの前記デジタル証明書に応じて認証動作を行って前記プレイリスト特定情報が正規のものであることを確認した後、前記プレイリスト特定情報に対応した前記プレイリストデータを前記記憶手段から読み出すこと特徴とする請求項1記載のコンテンツ再生システム。

[5] 前記管理手段、前記データ作成手段及び前記記録手段はゲートウエイサーバ内に構成され、

前記ゲートウエイサーバと前記データベースを有するコンテンツサーバとローカルネットワークを介して接続されていることを特徴とする請求項1記載のコンテンツ再生システム。

[6] コンテンツデータを番組単位で蓄積した少なくとも1つのデータベースを有するコンテンツ配信サーバ装置と、コンテンツデータの再生機能を有する少なくとも1つの端末とがネットワークを介して接続されたコンテンツ再生システムの制御方法であって、

前記データベースに蓄積されたコンテンツデータの番組毎の蓄積位置及び再生順番を示すプレイリストデータを作成して記憶手段に記憶して管理する管理ステップと、

前記プレイリストデータを特定するプレイリスト特定情報を含むプレイ指示データを

作成するステップと、

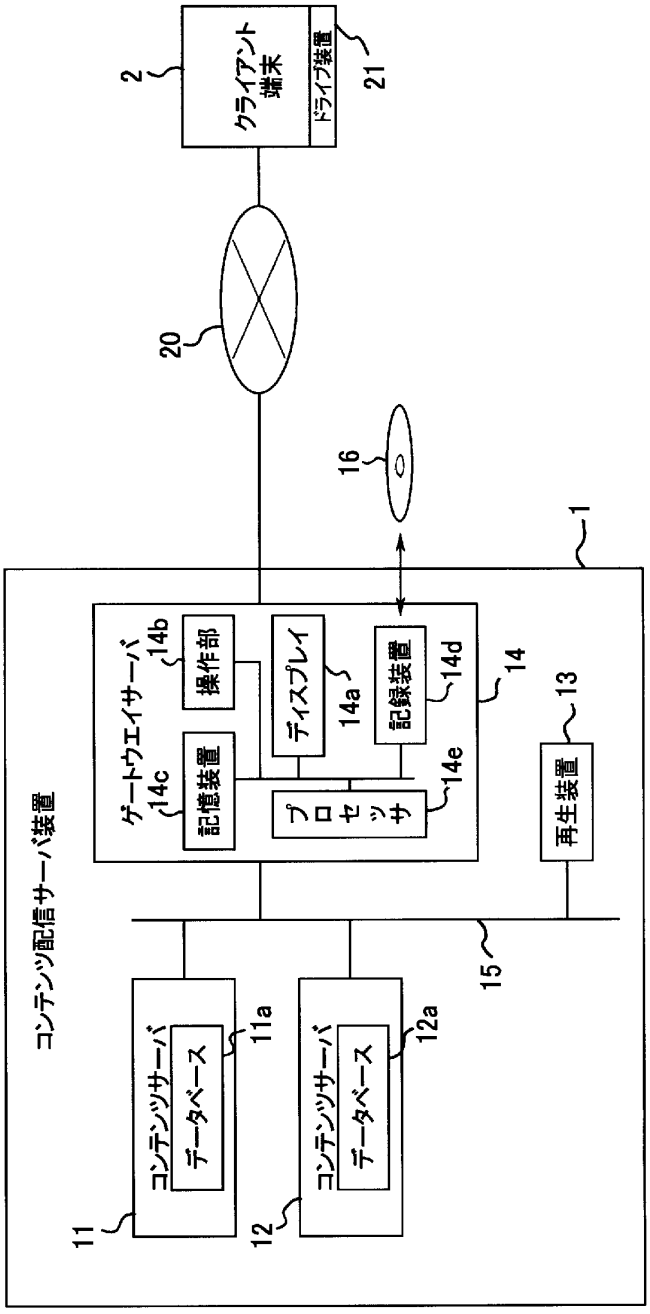
前記プレイ指示データを記録媒体に記録するステップと、

前記記録媒体の前記プレイ指示データを前記端末にて読み取る読取ステップと、

前記読取ステップにて読み取られたプレイ指示データ中の少なくともプレイリスト特定情報を前記コンテンツ配信サーバ装置に送信する送信ステップと、を備え、

前記管理ステップでは、前記プレイリスト特定情報に対応した前記プレイリストデータを前記記憶手段から読み出し、その読み出した前記プレイリストデータに示された蓄積位置及び再生順番で番組毎に前記コンテンツデータを前記データベースから読み出してそれを前記端末に前記ネットワークを介して転送し、前記端末ではその転送された前記コンテンツデータを受信して再生すること特徴とする制御方法。

[図1]


2
クライアント端末
ドライブ装置
21
20
16
1
コンテンツ配信サーバ装置
ゲートウエイサーバ
14b
操作部
14c
記憶装置
ディスプレイ
14a
プロセッサ
14e
記録装置
14d
14
13
再生装置
15
コンテンツサーバ
データベース
11a
11
コンテンツサーバ
データベース
12a
12

[図2]

(a)

第1コンテンツサーバのコンテンツリストデータ

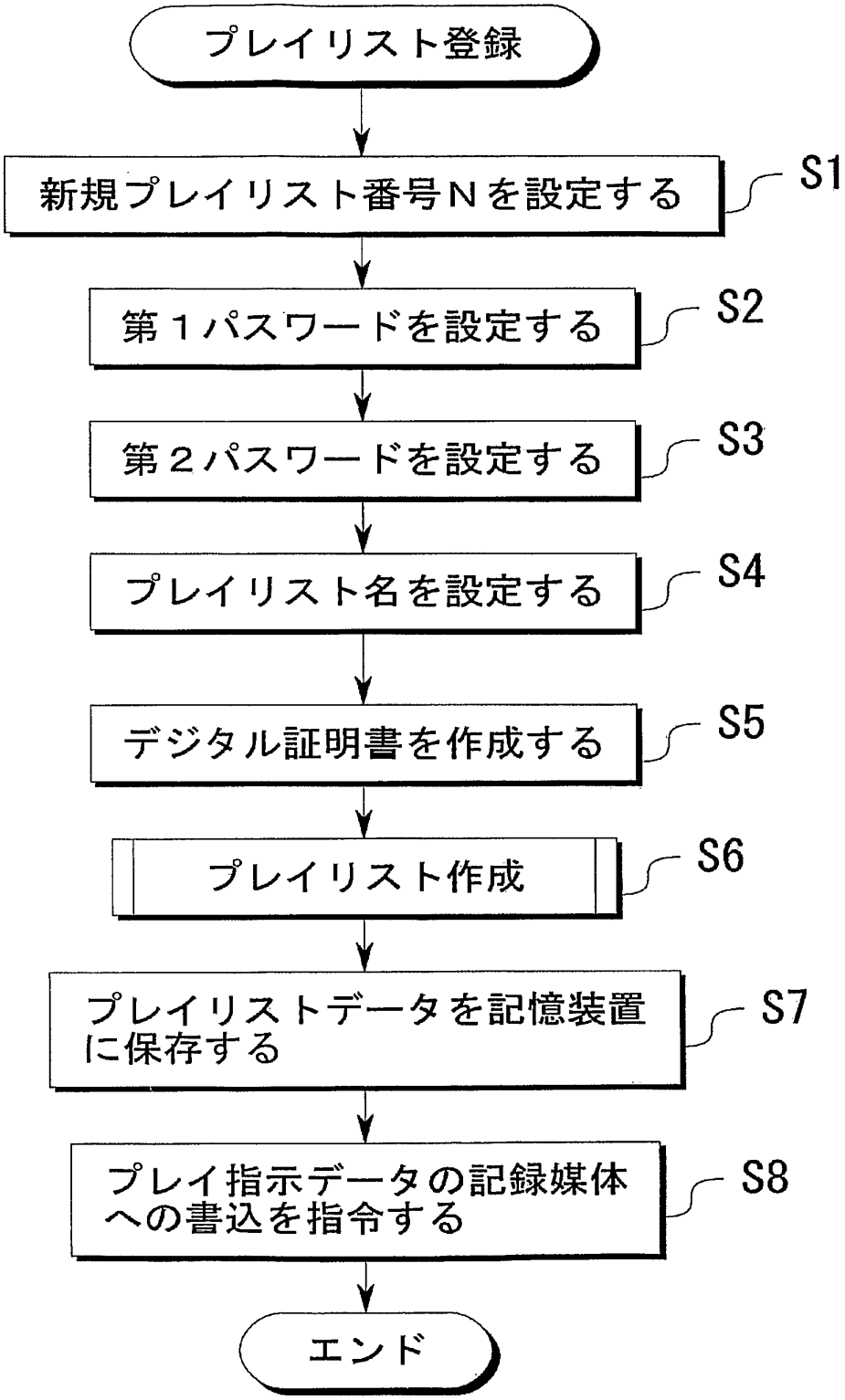
Id=/Video/PS_28.mpg
Title:7時のニュース;
Date: 2006-08-23T11:30:00
Duration=00:29:41.000
Info=・・・
Id=/Video/PS_29.mpg
Title:ワイド！スクランブル;
Date: 2006-08-30T10:00:00
Duration=01:00:00.000
Info=・・・
Id=/Video/PS_30.mpg
Title:駅伝中継;
Date: 2006-09-01T13:30:00
Duration=03:29:05.000
Info=・・・
Id=/Video/PS_31.mpg
Title:洋画劇場;
Date: 2006-09-02T21:30:00
Duration=01:55:00.000
Info=・・・
Id=/Video/PS_32.mpg
Title: 笑いのオリンピック;
Date: 2006-09-03T22:00:00
Duration=00:59:00.000
Info=・・・
Id=/Video/PS_33.mpg
Title: ドラマ「風」;
Date: 2006-09-04T19:30:00
Duration=00:58:30.000
Info=・・・

(b)

第2コンテンツサーバのコンテンツリストデータ

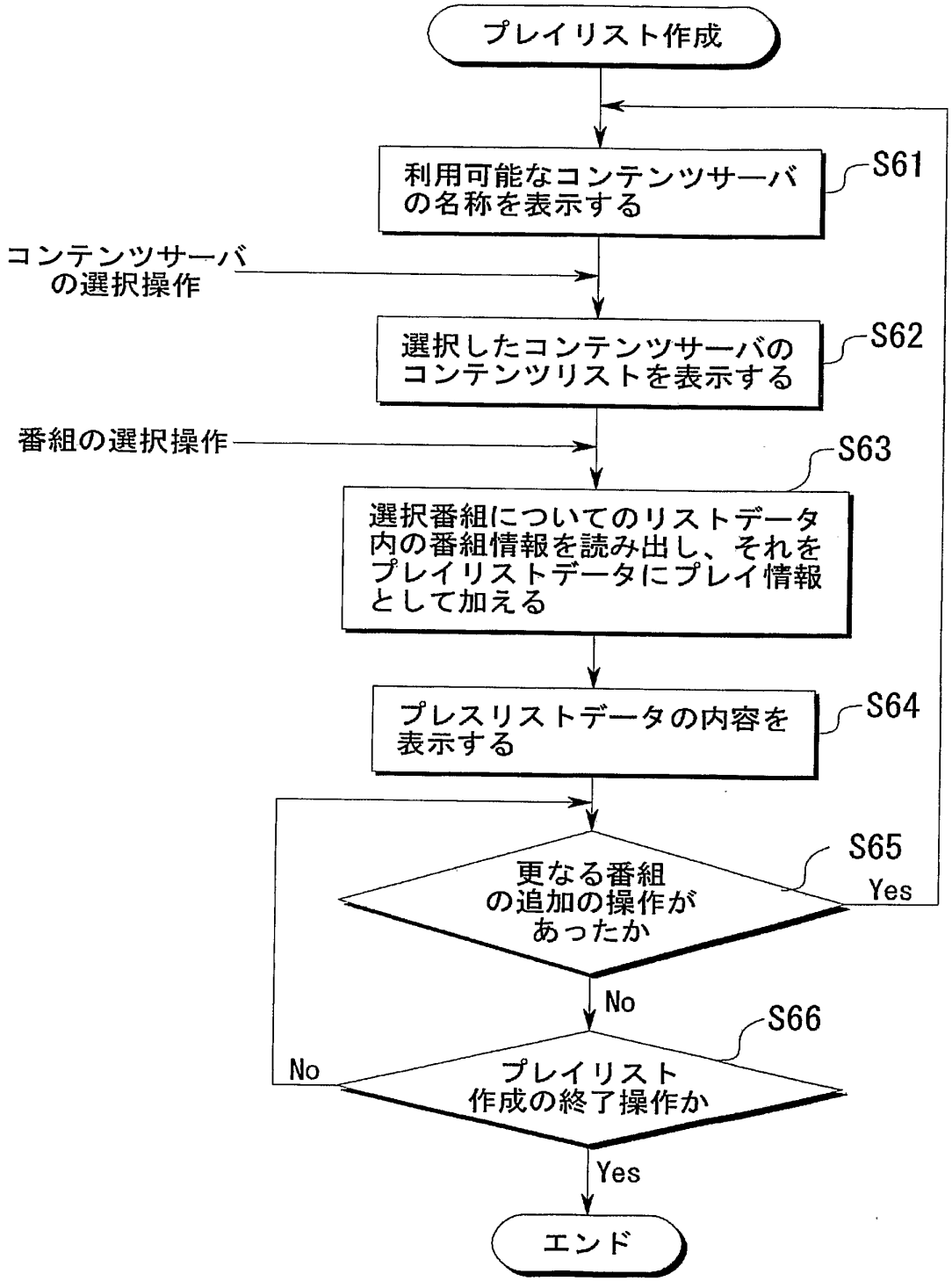
Id=/Video/PS_01.mpg
Title:9時のニュース;
Date: 2006-08-10T21:00:00
Duration=00:45:27.000
Info=・・・
Id=/Video/PS_02.mpg
Title:情報番組;
Date: 2006-08-16:T10:00:00
Duration=01:00:00.000
Info=・・・
Id=/Video/PS_03.mpg
Title:野球中継;
Date: 2006-09-01T18:56:00
Duration=002:43:05.000
Info=・・・

[図3]



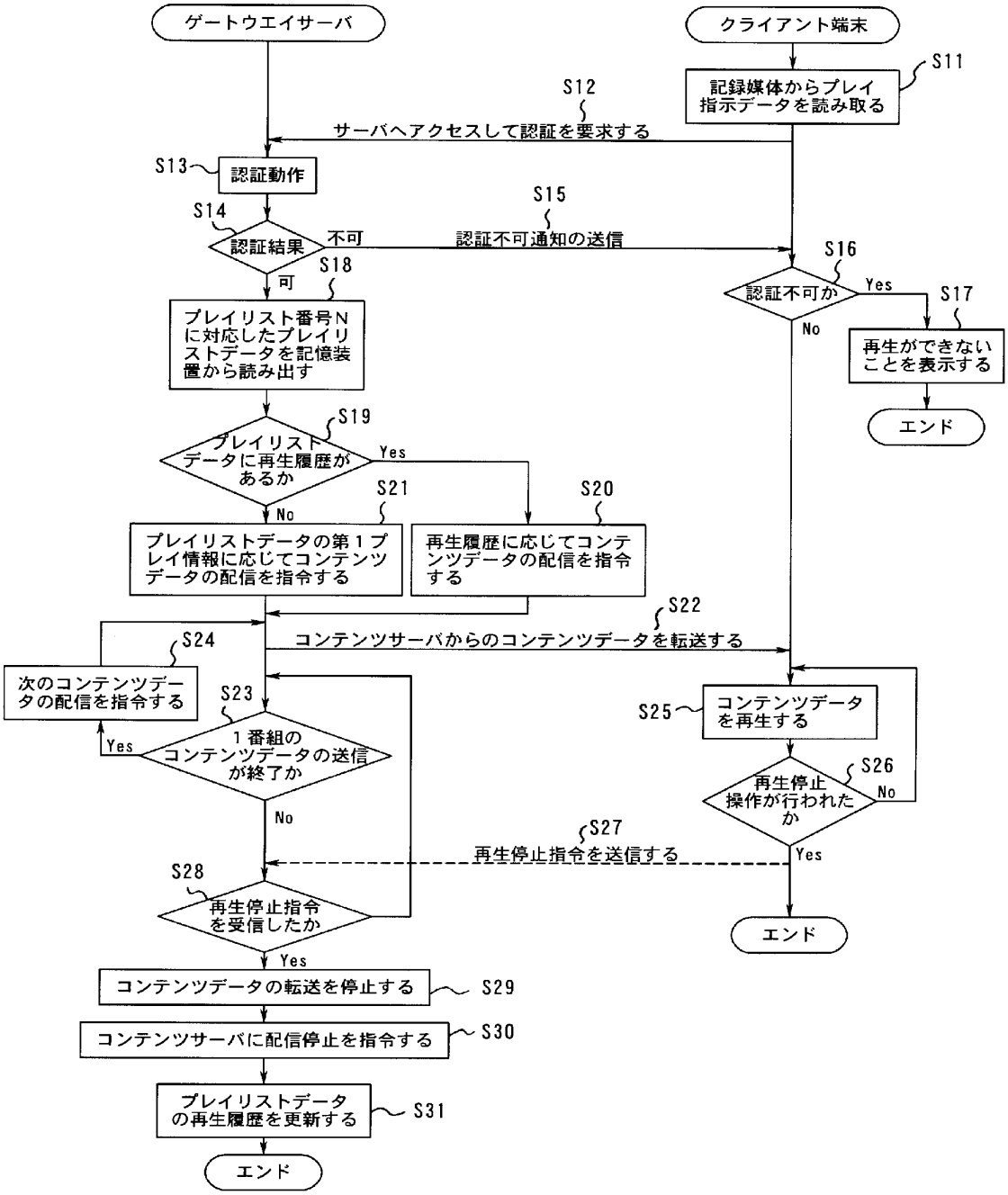

差替え用紙 (規則26)

[図4]

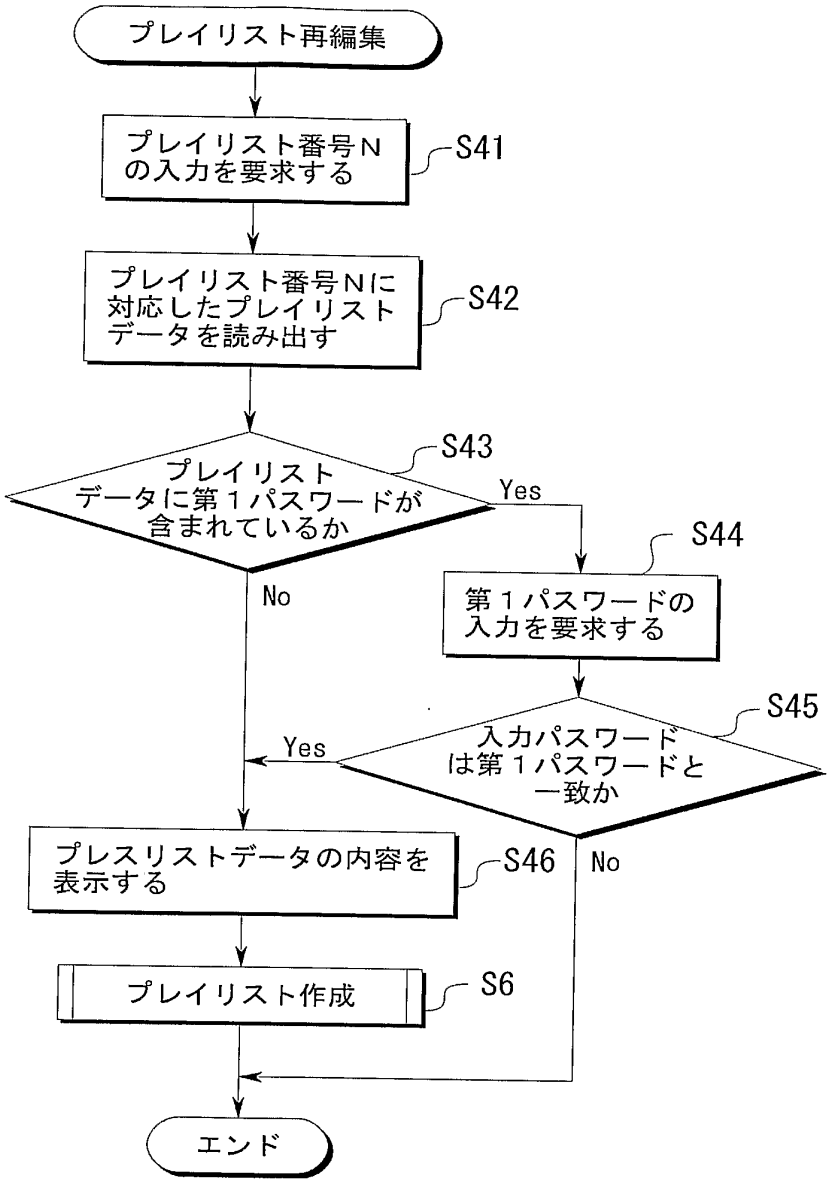



差替え用紙 (規則26)

[図5]


ゲートウエイサーバ
クライアント端末
S11
記録媒体からプレイ指示データを読み取る
S12
サーバへアクセスして認証を要求する
S13
認証動作
S14
認証結果
不可
S15
認証不可通知の送信
S16
認証不可か
Yes
S17
再生ができないことを表示する
エンド
No
可
S18
プレイリスト番号Nに対応したプレイリストデータを記憶装置から読み出す
S19
プレイリストデータに再生履歴があるか
Yes
No
S21
プレイリストデータの第1プレイ情報に応じてコンテンツデータの配信を指令する
S20
再生履歴に応じてコンテンツデータの配信を指令する
S22
コンテンツサーバからのコンテンツデータを転送する
S24
次のコンテンツデータの配信を指令する
S23
1番組のコンテンツデータの送信が終了か
Yes
No
S25
コンテンツデータを再生する
S26
再生停止操作が行われたか
No
Yes
S27
再生停止指令を送信する
S28
再生停止指令を受信したか
Yes
エンド
コンテンツデータの転送を停止する
S29
コンテンツサーバに配信停止を指令する
S30
プレイリストデータの再生履歴を更新する
S31
エンド

[図6]




差替え用紙 (規則26)

**INTERNATIONAL SEARCH REPORT**

International application No.
PCT/JP2007/055548

A. CLASSIFICATION OF SUBJECT MATTER
*H04N7/173*(2006.01)i, *G06F21/20*(2006.01)i, *G10K15/02*(2006.01)i

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)
H04N7/16-7/173, G06F21/20, G10K15/02

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched
Jitsuyo Shinan Koho 1922-1996 Jitsuyo Shinan Toroku Koho 1996-2007
Kokai Jitsuyo Shinan Koho 1971-2007 Toroku Jitsuyo Shinan Koho 1994-2007

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. |
|---|---|---|
| Y<br>A | JP 2006-172392 A (Kenwood Corp.),<br>29 June, 2006 (29.06.06),<br>Par. Nos. [0068] to [0069]; all drawings<br>(Family: none) | 1-3,5,6<br>4 |
| Y<br>A | WO 2003/102919 A1 (Onkyo Corp.),<br>11 December, 2003 (11.12.03),<br>Pages 43 to 56; Figs. 24 to 29<br>& AU 2003/241772 A1 & EU 1508892 A1<br>& KR 2005/003371 A & US 2005/0203991 A1<br>& CN 1659623 A | 1-3,5,6<br>4 |

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

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

| Date of the actual completion of the international search | Date of mailing of the international search report |
|---|---|
| 15 June, 2007 (15.06.07) | 26 June, 2007 (26.06.07) |
| Name and mailing address of the ISA/<br>Japanese Patent Office<br><br>Facsimile No. | Authorized officer<br><br>Telephone No. |

Form PCT/ISA/210 (second sheet) (April 2005)

**INTERNATIONAL SEARCH REPORT**

International application No.
PCT/JP2007/055548

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

| Category* | Citation of document, with indication, where appropriate, of the relevant passages | Relevant to claim No. |
|---|---|---|
| Y<br>A | JP 2001-249694 A (Matsushita Electric Industrial Co., Ltd.),<br>14 September, 2001 (14.09.01),<br>Par. Nos. [0272] to [0281]; Figs. 74 to 77<br>& EP 1056093 A1 & WO 2000/074060 A1<br>& CN 1321319 A & KR 2001-085310 A<br>& MX 2001/000997 A1 & US 6832293 B1 | 2<br>1,3-6 |
| A | JP 2006-47644 A (Denso Corp.),<br>16 February, 2006 (16.02.06),<br>Par. Nos. [0053] to [0083]; Figs. 1 to 16<br>(Family: none) | 1-6 |
| A | WO 2006/092996 A1 (Matsushita Electric Industrial Co., Ltd.),<br>08 September, 2006 (08.09.06),<br>All pages; all drawings<br>(Family: none) | 1-6 |

Form PCT/ISA/210 (continuation of second sheet) (April 2005)

国際調査報告

国際出願番号　ＰＣＴ／ＪＰ２００７／０５５５４８

Ａ．　発明の属する分野の分類（国際特許分類（ＩＰＣ））

Int.Cl.　H04N7/173(2006.01)i, G06F21/20(2006.01)i, G10K15/02(2006.01)i

Ｂ．　調査を行った分野

調査を行った最小限資料（国際特許分類（ＩＰＣ））

Int.Cl.　H04N7/16 - 7/173, G06F21/20, G10K15/02

最小限資料以外の資料で調査を行った分野に含まれるもの

| | |
|---|---|
| 日本国実用新案公報 | １９２２－１９９６年 |
| 日本国公開実用新案公報 | １９７１－２００７年 |
| 日本国実用新案登録公報 | １９９６－２００７年 |
| 日本国登録実用新案公報 | １９９４－２００７年 |

国際調査で使用した電子データベース（データベースの名称、調査に使用した用語）

Ｃ．　関連すると認められる文献

| 引用文献のカテゴリー＊ | 引用文献名　及び一部の箇所が関連するときは、その関連する箇所の表示 | 関連する請求の範囲の番号 |
|---|---|---|
| Y<br>A | JP 2006-172392 A（株式会社ケンウッド）2006.06.29,<br>段落[0068]-[0069]，全図（ファミリーなし） | 1-3,5,6<br>4 |
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(54) **Title**: CONTENT DISCOVERY AND DELIVERY PLATFORM APPARATUSES, METHODS AND SYSTEMS

(57) **Abstract**: The content discovery and delivery platform apparatuses, methods and systems ("CDDP") transform content seed selections and recommendations via CDDP components such as discovery and gurus into events and discovery of other contents for users and revenue for right-holders. In one embodiment, the CDDP may provide facilities for obtaining a universally resolvable list of content items on a local client and identifying a non-local item from the list that is absent on the local client. The CDDP may generate a local cache request for the identified non-local item having an associated universally resolvable content identifier and transmit the generated local cache request to a universally resolvable content server. The CDDP may then receive, in response to the transmitted request, a universally resolvable content item corresponding to the local cache request and may mark the requested item as temporary and locally available upon receiving the content item.

# CONTENT DISCOVERY AND DELIVERY PLATFORM APPARATUSES, METHODS AND SYSTEMS

**[0001]** This patent application disclosure document (hereinafter "description" and/or "descriptions") describes inventive aspects directed at various novel innovations (hereinafter "innovation," "innovations," and/or "innovation(s)") and contains material that is subject to copyright, mask work, and/or other intellectual property protection. The respective owners of such intellectual property have no objection to the facsimile reproduction of the patent disclosure document by anyone as it appears in published Patent Office file/records, but otherwise reserve all rights.

## CLAIM FOR PRIORITY

**[0002]** This application claims priority to and benefit from U.S. Provisional Application Serial No. 61/526,210 filed on August 22, 2011 titled CONTENT DISCOVERY AND DELIVERY PLATFORM APPARATUSES, METHODS AND SYSTEMS (Attorney Docket No. 20676-012PV1); U.S. Provisional Application Serial No. 61/496,512 filed on June 13, 2011 titled CONTENT DISCOVERY AND DELIVERY PLATFORM APPARATUSES, METHODS AND SYSTEMS (Attorney Docket No. 20676-012PV); U.S. Provisional Application Serial No. 61/387,450 filed on September 28, 2010, titled APPARATUSES, METHODS AND SYSTEMS FOR A MOLECULAR MULTIMEDIA SEARCH PLATFORM (Attorney Docket No. 20676-003PV); and U.S. Provisional Application Serial No. 61/387,453 filed on September 28, 2010 titled

APPARATUSES, METHODS AND SYSTEMS FOR A MULTIMEDIA PIVOT SEARCH PLATFORM (Attorney Docket No. 20676-004PV).

**[0003]** The entire contents of the aforementioned applications are herein expressly incorporated by reference.

## APPLICATIONS OF INTEREST

**[0004]** Applications of interest include: International Application Number PCT/US2009/061296, filed 20 October 2009, and entitled A METHOD AND SYSTEM FOR ACCOUNTING FOR DOWNLOAD TRANSACTIONS AND SOCIAL NETWORK INTERACTION (Attorney Docket No. 20676-017PC3); International Application Number PCT/US2009/061307, filed 20 October 2009, and entitled A METHOD AND SYSTEM FOR ACCOUNTING FOR DOWNLOAD TRANSACTIONS AND SOCIAL NETWORK INTERACTION (Attorney Docket No. 20676-017PC2); and International Application Number PCT/US2009/061309, filed 20 October 2009, and entitled A METHOD AND SYSTEM FOR ACCOUNTING FOR DOWNLOAD TRANSACTIONS AND SOCIAL NETWORK INTERACTION (Attorney Docket No. 20676-017PC1).

**[0005]** The entire contents of the aforementioned applications are herein expressly incorporated by reference.

## FIELD

**[0006]** The present innovations are directed generally to apparatuses, methods, and systems for multimedia applications, and more particularly, to CONTENT

DISCOVERY AND DELIVERY PLATFORM APPARATUSES, METHODS AND SYSTEMS.

## BACKGROUND

**[0007]** Consumers of music and other multimedia have several options to purchase music that they like. They may go to music retail stores such as BEST BUY, TARGET or other independent stores and purchase a copy of their desired album packaged in the ubiquitous compact disc (CD) format. Consumers may also purchase digital copies of music from online music stores such as ITUNES and AMAZON, and subscription based services from service providers such as NAPSTER.

## BRIEF DESCRIPTION OF THE DRAWINGS

**[0008]** The accompanying appendices and/or drawings illustrate various non-limiting, example, innovative aspects in accordance with the present descriptions:

**[0009]** FIGURE 1 shows a diagram illustrating discovery aspects in one embodiment of the CDDP;

**[0010]** FIGURE 2 shows a diagram illustrating example modes of discovery in some embodiments of the CDDP;

**[0011]** FIGURE 3 shows an example data flow illustrating generation of a magic playlist in some embodiments of the CDDP;

**[0012]** FIGURES 4a-b are logic flow diagrams illustrating magic playlist generation component in one embodiment of the CDDP;

**[0013]** FIGURE 4c-d are data flow diagrams illustrating remote client play in some embodiments of the CDDP;

**[0014]** FIGURE 4e is a logic flow diagram illustrating non-local content cache component in some embodiments of the CDDP;

**[0015]** FIGURE 4f is a logic flow diagram illustrating smart caching component in some embodiments of the CDDP;

**[0016]** FIGURE 5 shows a logic flow diagram illustrating stagelight/spotlight search in some embodiment of the CDDP;

**[0017]** FIGURE 6a shows an example shared discovery in some embodiments of the CDDP;

**[0018]** FIGURE 6b shows an example shared discovery settings configuration in some embodiments of the CDDP;

**[0019]** FIGURES 7a-c show logic flow diagrams illustrating shared discovery components in some embodiments of the CDDP;

**[0020]** FIGURE 8a shows a logic flow diagram illustrating the Gurus rewarding component in some embodiments of the CDDP;

**[0021]** FIGURE 8b shows a logic flow diagram illustrating the Gurus offer delivery and redemption component in some embodiments of the CDDP;

**[0022]** FIGURES 9-14 are schematic views of the example CDDP application interface in some embodiments of the CDDP;

**[0023]** FIGURES 15a-g are schematic views of the example stagelight/spotlight interface in some embodiments of the CDDP;

**[0024]** FIGURES 16a-c are schematic views of the discover stream component in some embodiments of the CDDP;

**[0025]** FIGURES 17a-f are schematic views of the discover lens component in some embodiments of the CDDP;

**[0026]** FIGURES 18a-c are schematic views of the discover stacking component in some embodiments of the CDDP;

**[0027]** FIGURES 19a-g are schematic views of the molecular discovery component in some embodiments of the CDDP;

**[0028]** FIGURES 20a-n are schematic views of the example mobile application interfaces in some embodiments of the CDDP;

**[0029]** FIGURES 21a-b are schematic views of the example mobile application molecular interfaces in some embodiments of the CDDP;

**[0030]** FIGURE 22a is a data flow diagram of an example content identification component in some embodiments of the CDDP;

**[0031]** FIGURE 22b is a logic flow diagram illustrating an example content identification in some embodiments of the CDDP;

**[0032]** FIGURE 23 is a logic flow diagram illustrating an example license acquisition component in some embodiments of the CDDP;

**[0033]** FIGURES 24a-b are data flow diagrams illustrating example licensing component in some embodiments of the CDDP;

**[0034]** FIGURE 24c is a logic flow diagram illustrating an example license acquisition component in some embodiments of the CDDP;

**[0035]** FIGURE 25 is a data flow diagram illustrating an example usage reporting component in some embodiments of the CDDP;

**[0036]** FIGURES 26a-b are logic flow diagrams illustrating example play count reporting components in some embodiments of the CDDP;

**[0037]** FIGURE 27 is a logic flow diagram illustrating an example royalty reporting component in some embodiments of the CDDP; and

**[0038]** FIGURE 28 shows a block diagram illustrating embodiments of a CDDP controller.

**[0039]** The leading number of each reference number within the drawings indicates the figure in which that reference number is introduced and/or detailed. As such, a detailed discussion of reference number 101 would be found and/or introduced in FIGURE 1. Reference number 201 is introduced in FIGURE 2, etc.

# DETAILED DESCRIPTION

## CDDP

**[0040]** In one embodiment, the CDDP allows unlimited, lifetime-of-device and lifetime-of-ownership access to a comprehensive catalog of music ("Infinite Music Library," "universal music library, "CDDP catalog") on licensed devices (LDs). Such LDs support digital rights management (DRM) and adhere to the CDDP specification for reporting instances of digital downloads and/or plays ("play count"). LDs include a licensed CDDP client (“application”), a full-features music management application providing access to a comprehensive catalog of music via catalog browsing, music discovery, social networking, track download and playback, and/or the like.

**[0041]** In some embodiments, the CDDP may include facilities for music downloads, music playback controls, library management, playlist management and sharing, license activation, account registration, artist, album or Guru browsing, automatic disc-space management features, music search, a variety of discovery interfaces include molecular, lens, streaming and stacking discovery interfaces, automatic playlist synchronization to the universal music library, and across one or more user devices, user library reconciliation ("beyondization"), side-loaded device management, direct social interaction through the CDDP community and extended social interaction with existing online communities such as FACEBOOK, MYSPACE, TWITTER and LINKEDIN, player add-ons that extend the capabilities of the CDDP application in search, recommendation, sharing and discovery, and/or the like.

**[0042]** In some embodiments, the CDDP may include a web-based browser interface with search, discovery, cloud-based content sync, social music features and

other components. For example, a CDDP user ("user," "consumer" or "customer") may download tracks, albums or playlists, may obtain song previews or listen to full length tracks, learn more about artists and their music, and discover related artists and their music.

**[0043]** In some other embodiments, the CDDP may include a portal or an application client for web-based partner (B2B) account management and partner interface functioning as the face of the one or more databases and/or tables. Some components of the CDDP may account for and pay copyright owners royalties, in a way that ASCAP, Harry Fox, SESAC or BMI may do, for each and every play of a digital music file on an LD. Copyright owners, including record labels, publishers, and other entities associated with content rights are referred to as partners.

**[0044]** The CDDP catalog includes a large number of content items that have been cleared for legal distribution and sharing among the CDDP users. Each content item in the CDDP catalog is uniquely identified. Some embodiments of the CDDP may facilitate assigning of unique identifier for licensed and distributable music. Other embodiments of the CDDP may further facilitate assigning of unique identifiers for unlicensed music on a local client device, thereby uniquely and universally resolving each content item.

**[0045]** The CDDP's user interfaces facilitate several modes of content discovery. Content discovery may allow users to discover new music, new social connections, new information, and/or the like. The CDDP may further facilitate users to expand and/or refine their own music preferences and knowledge base from others users' usage history, playlists, favorites, etc. In some embodiments, discovery may be driven by driven by a variety of factors including Gurus, personal usage patterns and/or content meta data. In

other embodiments, discovery may be facilitated by a variety of visually engaging and interactive user interfaces.

**[0046]** As such, aspects of the CDDP facilitate discovery, sharing, playback, and secure usage data aggregation and reporting, and/or the like.

**[0047]** The CDDP application may run on a variety of operating system platforms including Windows, Macintosh, iOS (Apple iPhone, iPod Touch, etc.), Android, Symbian, Java/J2ME, Samsung Bada, Windows Mobile 7, RIM Blackberry, HP Palm WebOS, Google Chrome, set top boxes (Linux), automotive devices, other mobile handsets, portable media players and consumer electronic devices. In some implementations, manufacturers may install a copy of the application in devices during manufacturing. The CDDP application may also be installed on devices, post-manufacture, by device resellers (e.g., mobile carriers), by technicians at a point-of-sale location, or by consumers themselves (e.g., from a website, an application store for mobile devices, web stores such as Chrome web store, etc.).

**[0048]** FIGURE 1 shows a diagram illustrating discovery aspects in one embodiment of the CDDP Platform. As illustrated in the diagram, a user 104/108 may be uninterested in his or her current selection of music on his or her LD. He or she may desire to know not just what is currently popular, or on the top 40 lists, but also what his or her friends are listening to, which tracks are being recommended, and/or the like. The discovery interface 116 facilitates the discovery of music which the user may enjoy using LDs 106/110.

**[0049]** In one implementation, the discovery interface 116 may include a network of friends 112 and/or subject experts known as "Gurus" 114 through whom the user

104/108 may discover music. Gurus are users who have opted in to the Guru program which is discussed in detail with respect to the Guru program component.

**[0050]** FIGURE 2 shows a diagram illustrating example modes of discovery in some embodiments of the CDDP. Examples modes of discovery 200 include, for example, Gurus 202, magic playlist 204, deep/molecular discovery 206, shared discovery 208, search 210, stagelight/spotlight search 212, infinite library home 214, and/or the like. Each of these modes of discovery 200 is discussed in greater detail below.

## Magic Playlist Generation (MPG) Component

**[0051]** Magic playlists are automatically generated playlist of content related to a "seed" item such as an artist, an album, a track, a playlist, another user or a combination thereof. In one embodiment, a magic playlist generation algorithm may utilize historical (e.g., listening/usage history), social (e.g., what friends are listening to), usage, profile, Gurus, track rating, crowd sourcing and other data to create a magic playlist. In one implementation of the MPG algorithm, these factors may be weighted using one or more weighting criteria. For example, in one implementation, a "social" weighting criterion may be selected. Such "social" criteria may result in more weight being accorded to social factors such as friends' listening history, Guru recommendations, crowd sourcing, etc. Similarly, other criteria may include personal usage (e.g., emphasis on the listener's usage history), profile (e.g., emphasis on the listener provided profile information), promotional (e.g., emphasis on music promoted by advertisers or other third parties), music traits (e.g., emphasis on music trait analysis), and/or the like. In some

implementations, a combination of one or more of these criteria may be utilized to identify tracks that a user is likely to enjoy and/or share with other users.

**[0052]** FIGURE 3 shows an example data flow illustrating generation of a magic playlist in some embodiments of the CDDP. As shown in FIGURE 3, in one implementation, a user 302 may request a magic playlist at 310 by selecting, for example an artist, as a content seed and clicking a "magic playlist" icon. In one implementation, the magic playlist request may be packaged as an HTTP(S) POST message for transmission to the servers 306. An example magic playlist request message 312 formatted in the eXtensible Markup Language (XML) form may be as follows:

```
POST /magicplaylist.php HTTP/1.1
Host: www.websitename.com
Content-Type: Application/XML
Content-Length: 1306
<?XML version = "1.0" encoding = "UTF-8"?>
<MagicPlaylist>
          <Username>dingdong555@gmail.com</Username>
          <Timestamp>2011-02-22 15:22:43</Timestamp>
          <ClientDetails>
                <ClientIP>192.168.23.126</ClientIP>
                <ClientType>smartphone</ClientType>
                <ClientModel>HTC Hero</ClientModel>
                <OS>Android 2.2</OS>
                <AppIinstalledFlag>true</AppInstalledFlag>
          </ClientDetails>
          <EventDetails>
                <Event>create magic playlist</Event>
                <SeedType>artist</SeedType>
                <SeedName>pink floyd</SeedName>
          </EventDetails>
</MagicPlaylist>
```

**[0053]** The magic playlist request message 312 may be transmitted to the servers 306 over the communication network 300 for further processing. In one implementation, the request 312 may be routed to those servers that are geographically proximal to the location of the user's client device 304. At 314, the servers may initiate generation of the requested magic playlist that may include a list of tracks selected based on the seed item and/or other factors. In one implementation, the servers 306

may execute the magic playlist generation algorithm to obtain a list of tracks for the requested magic playlist. Details of the magic playlist generation algorithm(s) are discussed with respect to FIGUREs 4a and 4b.

**[0054]** At 316, the created magic playlist may be saved in a playlist database 308. The playlists in the playlist database 308 may be available to all users or may be subject to restrictions imposed by the respective creators. At 318, content related to the magic playlist tracks may be retrieved. For example, if the magic playlist includes a track by the artist "Eagles," the related content may include, for example, a list of playlists including the same track that are created and shared by other users. Similarly, information such as similar artists, albums corresponding to the tracks, etc., may also be retrieved. Identification of related content information is further discussed in detail with respect to the SC component.

**[0055]** At 320, the generated magic playlist may be sent by the servers 306 over the communications network 300 to the client device 304. At 322, the related content information may also be sent over the communications network 300 to the client device 304. In one implementation, the response message 320 and/or 322 from the servers 306 may include track IDs and thumb nail images corresponding to the tracks in the magic playlist. In a further implementation, the response message 320 and/or 322 may also include information on related tracks, artists, albums, playlists including the magic playlist tracks, Gurus associated with the magic playlist tracks, and/or the like. The response message may specifically include track names, track IDs, album names, album IDs, artist names, artist IDs associated with the related content. An example response message 320 and/or 322 may be in XML format substantially in the following form:

```
<XML>
  <MagicPlaylist>
    <PlaylistInfo>
      <Username>dingdong555@gmail.com</Username>
      <Timestamp>2011-02-22 15:23:00</Timestamp>
      <PlaylistName>Pink Floyd Magic Playlist</PlayListName>
      <PlaylistImg>DM2345.png</PlaylistImg>
      <SeedType>artist</SeedType>
      <SeedName>pink floyd</SeedName>
    </PlayListInfo>
    <TrackIDInfo>
      <TrackID1>6786865</TrackID1>
      .
      .
      .
      <TrackID20>342554</TrackID20>
    </TrackIDInfo>
    <TrackImgInfo>
      <TrackImg1>DM3243.png</TrackImg1>
      .
      .
      .
    </TrackImgInfo>
    <RelatedArtistInfo>
      <RelatedArtist1>Genesis</RelatedArtist1>
      .
      .
      .
      </RelatedArtist9>Peter Gabriel</RelatedArtist9>
    </RelatedArtistInfo>
    <RelatedPlaylistInfo>
      <Playlist1>Jeb loves Roger Waters</Playlist1>
      <Playlist2>Jenna's Wall</Playlist2>
      .
      .
      .
    </RelatedPlaylistInfo>
  </MagicPlaylist>
</XML>
```

**[0056]** In one implementation, the CDDP client may receive the message 320 and/or 322 and may parse the received message to extract the track IDs. The CDDP client may also use the extracted track IDs to retrieve and display track information such as track name, track length, location of the track (e.g., local library, cloud library or connected device library), images, and/or the like.

**[0057]** In some implementations, the CDDP client may keep a log of various events associated with playlists which may include magic playlists. For example, a user may remove a track that was part of a playlist, and may create a new version of the playlist without the removed track. As another example, a user may reorder the tracks

within a playlist in a different sequence. Example playlist events logged by the CDDP client may include, but is not limited to: tracks removed from the playlist, name of artist upon which magic playlist was created, name of track upon which magic playlist was created, name of tracks in playlist, name of playlist upon which magic playlist was created, name of album upon which magic playlist was created, total times a playlist was renamed (track composition may or may not have changed), total times playlist was reordered, and/or the like. The log may be periodically uploaded to the CDDP server(s).

**[0058]** FIGUREs 4a and 4b are logic flow diagrams illustrating the MPG component in one embodiment of the CDDP. In one implementation, the CDDP may receive seed item information such as an artist, a track, an album, a playlist, a Guru, and/or the like at 402, which is provided as an input to the MPG algorithm. The seed item may be universally resolvable. A user may provide this information by selecting or entering the seed item. If the seed item is a content item as determined at 404, one or more content attributes that define the seed item may be extracted at 404. Examples of content attributes may include, for example, track meta data information such as album, artist, comment, copyright, title, track, performers, genre, label, cover art, song length, a globally unique identifier (GUID), and/or the like. The content attributes may further include stylistic traits such as female vocal, electric guitar, tonality, tempo, bass, etc. and/or the like.

**[0059]** If the user provided content seed is not a content item, the content seed may be analyzed using several heuristics. Examples of non-content items, i.e., items that are not content and do not have a corresponding media file, may include, for example, an entity graph, a Guru name, mood, tempo, comment and/or the like. At 418, content

seed representation heuristics may be determined. Examples of the content seed representation heuristics may include a specified default or predetermined item 418a, currently played track 418b, most played track 418c, favorite track 418d, favorite genre 418e, last purchase 418f, others 418g and/or the like. These representative heuristics may also be derived from aggregated correlation among entire community of users, circle of friends or entity graph.

**[0060]** In some implementations, entity graph may include social graph and interest graph. Social graph may include categories of friends and/or acquaintances from social networks such as FACEBOOK, MYSPACE, TWITTER, GOOGLE+, and/or the like. Social graph may also include categories of friends and acquaintances from the CDDP community and/or other communication media such as instant messengers, contacts from address books, and/or the like. Interest graph may include categories of friends and acquaintances from any of the above social networks and the CDDP community who have an interest profile similar to a user. Additionally, an interest graph of a user is more expansive and may include people that do not have a social relationship with the user, but with who the user may share similar interests, usage pattern, listening history, and/or the like. In addition to people, entities may also include organizations and companies reachable through any of the mentioned social networks, CDDP community network and other communication media.

**[0061]** Referring to FIGURE 4a, content information pertaining to one or more of these heuristics may be retrieved at 420. For example, for the last purchase heuristic 418f, an album ID or a track ID corresponding to the last purchase made by the user

may be obtained. Now that the non-content item seed is transformed using heuristics to a content item seed, the attributes of the content item seed may be determined at 406.

**[0062]** At 414, user profile preference information may be retrieved. The user profile preference information may include user provided information such as favorite artist, favorite genre, album, etc. Such information may be provided by the user during registration, profile creation or profile update. The user profile preference may also be derived from the user's CDDP profile. The CDDP profile may be an "in house" profile organically built over time using information learned from the user, such as listening history. The CDDP profile may include not only information such as the user's preferred album, tracks, artists, genre and other attributes, but also a breakdown of the user's preferences according to location, time, mood (e.g., mood indicated by the user's mood status) and/or the like. For example, the CDDP may track and analyze the user's listening history over time to surmise that the user is likely to listen to ambient music late at night, rock music in early morning, and instrumental music at midday, etc. Furthermore, the user profile preference information may facilitate the CDDP's efforts to pre-fetch tracks in anticipation of the user's desire to listen to such pre-fetched tracks.

**[0063]** Further at 416, the user's social graph information may be retrieved. Social graph information may include friends, family, acquaintances, corporate entities, and/or the like. Social graph connections may exist within the CDDP network as well as other social network sites such as FACEBOOK, TWITTER and LINKEDIN. Using the entity graph information, the CDDP may obtain information such as music his or her friends are interested, their listening history, playlists, currently played, most played, favorite, last purchased tracks, artists or albums, and/or the like. In a further

implementation, the degree of separation and/or degree of friendship between the user and members of his or her social network may be taken into consideration. The degree of friendship may be established using information provided by the user and/or information derived from the frequency of communication exchanged between two users, existence of similar relationship in multiple social networks, and/or the like. The degree of separation may be established using the social graphs of various users in the network.

**[0064]** In one implementation, one or more weighting categories may be established in order to determined a magic playlist that embodies not just the musical attributes, but also one or more social and personal preferences. These categories may be selected manually at 422, which may trigger a dialog box requesting, for example, the user to select or input one or more social/personal categories that should be considered. The user selected category preferences may then be loaded at 428. On the other hand, these categories may be predefined parameters in the algorithm, in which case, applicable categories may be retrieved at 424. These categories may include, for example, the user's listening history, thumbs up/down rating of tracks, Guru rating of tracks, the user's friends' listening history, most recently played, most frequently played, most shared, most purchased, recently released, day/time preferences, and/or the like. Further, each category may be assigned its category weight. In one implementation, these category weights may be predetermined and as such, set by the CDDP at 426. In an alternate implementation, these category weights may be included in the loaded preferences specified by the user at 428. The user, when asked for category selections, may also be requested to specify how important that category is for the user. (For e.g.,

How important is social influence - select one: (a) very important, (b) not so important or (c) indifferent).

**[0065]** Referring now to FIGURE 4b, the extracted content attributes, along with the retrieved user profile preferences and social graph information, may be utilized to form a query for searching a list of content items that have matching or similar content attributes. Such a search may be executed on one or more databases and/or tables of the CDDP at 430. Further, such a search may be executed for relevancy, popularity, aggregated popularity, and/or the like. Relevancy, for example, may be established in various ways. Consider, for example, an artist ATB as a seed item. ATB may have attributes such as trance roots, dance feel and female vocal. A relevancy search based on these attributes may find other artists/tracks having these attributes. Further, a three attribute match may be considered more relevant than a two-attribute match. In some implementations, relevancy search may be based on fingerprinting technologies provided by third party services such as Gracenote.

**[0066]** At 432, for each heuristic category, the magic playlist algorithm may be used to identify content items for the magic playlist. A query based on each content criterion may be constructed and run on one or more databases and/or tables at 432. Although each query may result a small or large number of results, only the first n number of results having high similarity metric may be selected. At 436, the category weight may be assigned to each category items obtained from the query. The process may continue until all the category item results have been assigned category weights. When all the categories have been exhausted at 438, each content item result for each category may be assigned a position factor or ranking based on relevance at 440. In one

implementation, the algorithm may determine "relevancy" by calculating a relevancy score for each identified track. Table 1 below illustrates example results from a query based on four criteria and the calculation of the relevancy score for each unique result.

| *CATEGORY (C) POSITION (P)* | *1* | *2* | *3* | *4* |
|---|---|---|---|---|
| 10 | Track A | Track B | Track C | Track D |
| 9 | Track X | Track A | Track Y | Track A |
| 8 | Track B | Track P | Track Q | Track E |
| 7 | Track C | Track R | Track F | Track J |
| ... | ... | ... | ... | ... |
| 1 | Track Q | Track J | Track J | Track A |

**[0067]** For each unique track t, based on the category weight (C) and the position weight (P), the relevancy score may be calculated as below in one implementation:

**[0068]**
$$S_{t=1\,to\,x} = \sum_{j=1}^{M}\sum_{k=1}^{N} C_j \times P_{jk}$$

**[0069]** Where, S = relevancy score, x = track, j = category and k = position in the list. In this example, M = 4 and N = 10.

**[0070]** At 442, the weights (category and position) may be used to input in the formula above to obtain the relevancy score for each unique track identified. The highest value tracks i.e., the unique tracks having the highest relevancy scores S may be sorted at 444. At 446, top x number of the highest value tracks (e.g., 20 tracks) may be selected

for inclusion in the requested magic playlist. In some implementations, other methods of calculating relevancy based on weighted criteria may be utilized.

**[0071]** Once the content items for the magic playlist have been identified, the magic playlist may be sent to the requesting user's client device. The user may then select a content item to play. FIGUREs 4c-d show data flow diagrams illustrating remote client play in some embodiments of the CDDP. In FIGURE 4c, a client device 478 may make an application programming interface (API) request to an API server 476 that returns metadata information for the selected content item. If the content item is licensed for the authenticated user, download universal resource locators (URLs) for standard/mobile audio files may be included. The API request 484 may in one implementation be a JSON over HTTP POST request. Another HTTP post request 486 may then be made to a content distribution network (CDN) 480 for downloading an audio/video file for the requested content item using the appropriate download URL obtained from the API server 476. In one implementation, the CDN may be utilized for facilitating faster downloads. The CDN may be in communication with a media server 482 over HTTP for 486 for obtaining copies of the audio/video files. The downloaded audio/video file may then be played back by the user.

**[0072]** Referring now to FIGURE 4d, data flow between the CDN 480, the CDDP client and the user interface 494 is discussed in more detail. In one implementation, the CDDP client may include a download thread 490a, a media player 490b and an Input/Output (I/O) stream interface 490c. In one implementation, the download thread 490a and/or the I/O stream interface 490c may be substantially implemented using C++. In some implementations, the media player 490b may be implemented using a

software development kit (SDK) that are digital rights management (DRM) compatible. The download thread 490a may track the download status of a content item (e.g., an audio file). For example, the item being downloaded may be saved locally as a local audio file 490. The download thread 490a may track the download status and may issue download status events to indicate state transitions for the local file. Examples of state transitions may include “downloading” to “playable” to “downloaded.”

**[0073]** When the user interface 494 receives the download status event 496a from the download thread 490a indicating that the local audio file is playable, it can start playback. When the user selects a play control from the user interface 494, the play event 492b may be sent to the media player 490b to begin playback of the requested local audio file 490. The media player 490b may then issue playback events that are used in the generation of playback status events 492c for the user interface, and in playcount event recording. In one implementation, the audio file may become playable after only a small portion of the file is downloaded. In one implementation, the small portion may include only the license, the MP4 atoms, and/or the portion of the encrypted content that contains the first sample of the unencrypted content. For a track that is 3 minutes and 30 seconds long, it may be playable after approximately 30kB (e.g., mobile quality file size), and approximately 50 kB (e.g., standard quality file) have been downloaded.

Content Caching Component

**[0074]** In some embodiments of the CDDP, one or more local client devices may be provided with facilities for media content caching. In one implementation, caching may be limited to those content items that are not available locally in the client device.

In another implementation, caching may be for those content items that match the client device owner specified preferences. Caching may be carried out in the background without any active user intervention in some implementations.

**[0075]** FIGURE 4e is a logic flow diagram illustrating the content caching component in some embodiments of the CDDP. In one implementation, a user may select or input a content item at 450. For example, a user may select an artist as a content seed. The selected content item may be received by the server at 452. The server may then identify the selected content item at 454 and determine related content based on the item at 456. For example, if the user selected artist "Janelle Monae", the CDDP platform may identify tracks related to the artist, albums related to the artist, information about the artist, playlists including tracks by the artist, artists similar to Janelle Monae, and/or the like. The determination may include creating a content query based on the received input and/or other input identifying information and querying one or more content databases using the created content query. The related content data determined by the CDDP may be sent to the user's client device at 458 and may be received by the user's client device at 460.

**[0076]** In one implementation, at 462, a determination as to whether any of the tracks returned by the search are non-local tracks. In some implementations, non-local tracks are tracks that are not available locally in the client device. For example, non-local tracks may be present in the universal music library in the cloud, but are absent in the user's local device, either in one or more media folders, or cache. This determination may be achieved, for example, by comparing the track IDs returned from the search with the track IDs of the tracks saved locally. If there are no non-local tracks, i.e., all tracks

from the search result are local, those tracks may be marked as locally available using an indicator at 466 to distinguish them from non-local tracks. The related content may then be displayed on the client device at 468.

**[0077]** On the other hand, if one or more tracks are non-local tracks, a local cache request may be generated for requesting the non-local tracks from the server. In one implementation, the local cache request for the non-local tracks may be in XML format substantially in the following form:

```
<XML>
     <ClientDetails>
          <ClientIP>192.168.22.111</ClientIP>
          <ClientType>smartphone</ClientType>
          <ClientModel>HTC Hero</ClientModel>
          <OS>Android 2.2</OS>
      </ClientDetails>
     <UserName>JaneSmith@gmail.com</UserName>
     <NonLocalTrackDetails>
          <Track1ID>238348</Track1ID>
          <Track2ID>338458</Track2ID>
          .
          .
          .
          <Track18ID>245788</Track18ID>
     </NonLocalTrackDetails>
</XML>
```

**[0078]** The server may receive the request for non-local track and may retrieve the requested tracks from one or more media content databases using the universally resolvable track ID in the XML request at 470. The retrieved tracks may then be sent to the requesting user's client device at 472. The requested tracks may be received by the client device at 474 for temporary storage in the client device cache. The received tracks may be encrypted, and may become playable after only a small portion of the content file is downloaded.

**[0079]** In one implementation, the content items stored in the cache may be made permanent by the user at any time as long as the item has not been cleared from the cache. The CDDP client may mark the previously local tracks as locally available tracks

at 466 and may update the CDDP client interface to display the received and/or identified related content data at 468.

**[0080]** In another embodiment of the CDDP, the content caching component may facilitate caching of non-local items in a media content collection explored, created or copied by a user. For example, a user may create a playlist (or request a magic playlist) which may include a list of tracks. The CDDP may then automatically determine whether any of the tracks in the list are non-local, and if so, may obtain the non-local tracks for temporary storage in the local cache. Such automatic caching for non-local items may enhance user experience, whether the user is online or offline, with seamless delivery of music.

**[0081]** In some implementations, the content caching component may include a cache manager component. The cache manager component may facilitate management of content data stored temporarily in the cache. When cache memory is filled up, there may not be enough space in the cache to store new content items. In order to make room for new content items, older content items may have to be deleted. The cache manager may determine which content items to delete based on various factors such as priority, play count, last play date and time, size of content items, date and time of storage, and/or the like. In one implementation, priority may be determined based on user preference. In another implementation, priority may be determined based on track play attributes. For example, if a content item is a recommendation engine ranked song or of a ranked album, the content item may have a higher priority and thus may not be the first track to be deleted.

Smart Caching (SC) Component

[0082] Some embodiments of the CDDP may include an SC component that may facilitate smart caching of content items that are likely to be consumed by a user. The SC component may include a recommendation engine that generates music recommendations based on, in one implementation, users' implicit interests. In a further implementation, the SC may also include a cache manager component that manages caching queue. Together, the recommendation engine and the cache manager may identify tracks that are likely to be of interest to the user, and download the identified tracks to the user's client cache. In one implementation, a user's interests may be derived from the behavioral and use data collected from the user's client and/or website. For example, length of play, i.e., whether the user plays a track for 10 seconds or the full length, may be a strong indicator of the user's interest in that particular track, genre or artist. Similarly, if the user adds a track to a playlist, creates a magic playlist with a track or shares a track, such activities may also be a strong indicator of the perceived value of the track to the user. As yet another example, tracks that are played in proximity in terms of timing and/or session may also suggest common clusters for recommendation.

[0083] In some implementations, the collected play data may include, but are not limited to play data such as track play detail, track added to playlist, track shared, rating, track plays in close proximity, track ID, track bookmarked, track used to create magic playlist, and/or the like. Track play detail may include information such as genre, data and time of play, partial or full play, and/or the like. In one implementation, a play that is less than 30 seconds long may be classified as partial play, while a play that is longer than or equal to 30 seconds may be classified as full play. In other

implementations, the critical play length may be a number different from 30 seconds, or may even be a percentage of the track length (e.g., a track play that is at least 30% of the track length may be considered a full play).

**[0084]** In some implementations, the collected data may also include personally identifiable information (PII), user ID, and/or the like. In one implementation, PII may include any information (i) that may identify or may be used to identify, contact, or locate the person to whom such information pertains; and (ii) from which identification or contact information of an individual person is derived. In some implementations, PII may include, but is not limited to: name, address, phone number, fax number, email address, financial profiles, medical profile, social security number, credit card information, and/or the like. Additionally, in some other implementations information such as a personal profile, unique identifier, biometric information, IP address, and/or the like associated with PII may be considered PII. In yet other implementations, PII may not include information that is aggregated or collected anonymously (i.e., without identification of the individual user) or demographic information not connected to an identified individual. In some implementations, PII may include third party PII. In some implementations, user ID may be a totally anonymous number series or alphanumeric characters.

**[0085]** Using the collected data, the recommendation engine may in some implementations, aggregate tracks, artists, albums, Gurus, playlists that are consistently favored or banned by the user. The recommendation engine may also keep track of user ratings (e.g., thumbs up, thumbs down) for content items. In a further implementation, the aggregated tracks may be periodically refreshed to ensure that the recommendation

source content items are currently of interest to the user. These recommendation source content items may also be a part of the user profile in some implementations. Table 1 below shows example fields of data collected and maintained by the recommendation engine.

| *FIELD* | *DATA TYPE* |
|---|---|
| most_played_artist | char |
| most_played_album | char |
| most_played_playlist | char |
| most_played_genre | char |
| most_played_track | char |
| artists_filtered_out_as_thumbs_down | char |
| playlists_filtered_out_as_thumbs_down | char |
| albums_filtered_out_as_thumbs_down | char |
| tracks_filtered_out_as_thumbs_down | char |
| guru_filtered_out_as_thumbs_down | char |
| artists_flagged_as_thumbs_up | char |
| playlists_flagged_as_thumbs_up | char |
| albums_flagged_as_thumbs_up | char |
| tracks_flagged_as_thumbs_up | char |
| guru_flagged_as_thumbs_up | char |
| tracks_bookmarked | char |
| most_shared_track | char |
| most_popular_track_in_interest_graph | char |

**[0086]** In some implementations, the recommendation engine may consider one or more of the listed fields of collected data to identify seed content items for recommendation. For example, the recommendation engine may consider the tracks identified by the fields: most_played_tracks, tracks_filtered_out_as_thumbs_up, most_shared_track and most_popular_track_in_interest_graph. The recommendation engine may then compute a fingerprint for each recommendation seed using a fingerprinting technology. The fingerprinting technology may use digital signal processing algorithms to process actual audio signal of a recording to compute the fingerprint.

**[0087]** In some implementations, the recommendation engine may package the recommendation seeds and/or other identifying information in an XML format and send to a third-party service such as Gracenote MusicID Service via an application programming interface (API) for identifying related content. In yet other implementations, recommendations may be generated using crowd sourcing methods such as that of Pandora or collaborative filtering approach of Amazon (e.g., others who bought x, also bought y).

**[0088]** FIGURE 4f is a logic flow diagram illustrating smart caching component in another embodiment of the CDDP. At the start 491a, the user may request download of a new multimedia file at 492. Using the attributes of the multi-media file and/or other play detail information, at 493, the user's preference profile is updated. At 494, as soon as an engageable portion of the multimedia file is obtained, it is ready for playback if requested by the user. At 495, the SC component may identify content items for smart caching. The SC component may utilize the recommendation engine to identify the

content items for smart caching. At 496a, the SC component may determine whether there is an existing intelligent download list/queue. If there is an intelligent download list, the SC component may update the list with the identified content items at 496b. If there is no intelligent download list, one may be created at 496c using the identified content items. At 497, the SC component may determine if the user has enough bandwidth to determine the number of concurrent downloads. If the bandwidth is high enough to download at least one file, the SC component may instruct the CDDP cache manager to identify and delete local multimedia in the cache to make space for the new files at 498b. If the user bandwidth does not have enough bandwidth at 498a, the SC component may hold caching until user bandwidth is ideal at 498c. Once the bandwidth is ideal, the SC component may provide the additional multimedia content to local client device according to the intelligent download list at 499. This may conclude the SC component caching at 491b.

Stagelight/Spotlight Search

**[0089]** FIGURE 5 shows a logic flow diagram illustrating stagelight/spotlight search in some embodiments of the CDDP. In one implementation, the stagelight search may begin at 502 with a user selection of a content item for stagelight search at 504. For example, a user may select a track, artist, album, etc., and initiate a stagelight search. The selected content item may be received by the server at 506. The server may then initiate user selection tracking. User selections and the sequence in which such selections are made may be employed to generate a search path history.

**[0090]** At 508, the selected content item may be identified as an artist, track, album, playlist and/or the like. Using the identified content item, other related content

items may be searched and identified at 510. In some implementation, related content items may include albums, tracks, artists, Gurus, playlists, and/or the like. The related content item data may then be sent to the user's client device at 512. The sent content item data may be utilized to render an updated client interface at 514. At this time, the user may continue interacting with content items to discover related content items. For example, the user may select a related content item, which may lead to discovery of additional related content items. If the user wishes to stagelight a related content item displayed on the user interface, the user may select the content item and may click on stagelight option or icon at 504.

**[0091]** In another implementation, the stagelight interface may feature a drag and drop interface, where the user may stagelight a content item by dragging and dropping the content item to a stagelight object. At 516, the user may decide to not stagelight any of the related content items, at which point the user may exercise the option to view the search path traversed so far. At 518, the user may request to view the search path traversed, and in response, the server may retrieve the stored user selections including indications of the sequence in which they were selected and may send them to the client device at 522. At 514, the client device may receive the search path data and may render the graphical interface to display the search path taken by the user as the user traversed through related content items. The process may end at 520 when the user exits the stagelight search interface within the CDDP client.

Shared Discovery Component

**[0092]** FIGURE 6a shows an example shared discovery in some embodiments of the CDDP. In one implementation, the CDDP facilitates graphical discovery of shared

content items through the network of users of the CDDP and/or the network of users of other social networking sites such as FACEBOOK, MYSPACE, LINKEDIN, etc. For example, using the CDDP GUI 600, a user may see a list of all other users who are sharing their content (e.g., library, playlists, etc.). The user may navigate further by selecting options such as "home," "people," "names," "content," "type," "content list" and/or the like. When the user selects "home," a list of options 610 may appear under the "home" column for further selection. In one implementation, the "home" option 610 may include an option to select people, music, books, video, apps, and/or the like. As shown in FIGURE 6a, the user may select "people" from the column 610. The selection may then populate the "people" column 612 for further selection options. These options may include Gurus, social, friends, favorites, and/or the like. In one implementation, the user may select "Gurus" from the column 612. The selection of "Gurus" may in turn populate the next column 614 with Guru names for further selection. In one implementation, the user may select a Guru name (e.g., Steve Mori) from the names column 614. The selected user (i.e., Steve Mori) may have configured for sharing one or more content items such as albums, genre, artists, purchased, tempo, mood all content, playlist, and/or the like as shown in the content column 616. Further granularity in terms of content type 618 and content list 620 may also be available for selection in some implementations. As shown in FIGURE 6a, the user may be provided an option to select "albums" from the content column 616, which in turn may provide a drilled down view of content type 618 for selection. Examples of content type may include most recently played, most highly rated, purchased, all, and/or the like. Any selection of the content type items from the content type column 618 may lead to a display of content list in column 620. As shown, the content list may display a list of tracks under any of

the selected content type (e.g., most recently played). In one implementation, the user may select any of the displayed tracks for playing, downloading or creating magic playlist. In another implementation, the user may generate a playlist including all or selected tracks from Steve Mori's shared library. For example, the user may create a playlist including the most recently played tracks, most highly rated tracks or all tracks.

**[0093]** In one embodiment, users who wish to share their content with other users may be able to individually configure their social privacy settings to define what items they would like to share and what items they would like to keep private. FIGURE 6b shows an example shared discovery settings configuration in some embodiments of the CDDP. In one implementation, a user may select profile settings option from the menu to view the profile settings interface. An example profile settings interface may include options to configure social settings, device settings, publishing settings, and/or the like. In one implementation, the user may select social settings to reveal an interface including options for social privacy settings. In a further implementation, the social privacy settings interface may include options to select who can view what type of contents from the user's library contents. Example options for selecting who can view may include friends, friends of friends, social network members, network members, anyone, and/or the like and any combination thereof. Example options for selecting what can be viewed may include see everything, see playlists, see most recently played, see only selected, and/or the like and any combination thereof. As shown in FIGURE 6b, a user may select to let his friends see everything. In an alternate implementation, there may be options to configure social privacy settings on a group basis. For example, the user may configure to let his friends see everything, friends of friends see most recently played, anyone see his playlists, and/or the like.

[0094] In some implementations, the privacy settings may include options to specify the people, music, books, video, apps, and/or the like listed in column 610 in FIGURE 6a. For example, the user may configure people who are gurus named Jenna J., JJ Abrams or Guettafan access to albums, purchased and playlist content that are most recently played. In this way, only the specified gurus may be given access to specified content type.

[0095] FIGURE 7a shows a logic flow diagram illustrating shared discovery in some embodiments of the CDDP. In one implementation, the process may begin at 200 with a user using his or her client device to request access to a member's content data at 702. The request may involve, for example, selection of the member's name or alias. The request may be received by the server at 704. The server may then retrieve the member's privacy settings at 706. In one implementation, the relationship between the member and the requesting user may be determined for applying the member's privacy settings. For example, the member's privacy settings may permit sharing with friends, and the relationship between the member and the requesting user may be determined in order to facilitate the user's request. At 708, a determination may be made whether the requesting user should be granted access to the member's content data. Based on the privacy settings and/or the member-user relationship, if the user is not granted access to the member's shared content data, a notification message indicating denied access may be generated and sent to the user at 710. Such a notification message may be received and rendered on the client interface at 712. At this time at 714, the user may select another member and request access to the selected member's shared content, or may end the process at 716.

[0096] If the user is granted access to the member's shared content, the server may retrieve and send to the user's client device permitted content selections at 718. Permitted content selections may include the contents selected by the member for sharing with users of certain designations such as friends, friends of friends, network members, etc. The permitted content selections may be received by the user's client device for rendering on the client interface at 720.

Shared Content Management (SCM) Component

[0097] The shared media content management component of the CDDP may, in some embodiments, allow multiple users to collaboratively manage a shared media content collection such as a media library, a portion of a media library, a playlist, a specific collection (e.g., "my jazz collection" or "Smith family library"). Collaborative management may take various forms depending on the type of users involved. For example, a family may seek to create and maintain a single "family library" which can be modified by one or more family members using their individual LDs such that each LD having access to the "family library" may be automatically synchronized to display the most recently modified "family library." As another example, two friends, each having their own LD, may seek to manage a shared "jazz collection." The shared "jazz collection" would then be commonly owned by the two friends and any change one makes to the collection would be immediately reflected in the collection displayed to the other friend if the friend is connected to the internet, or upon connection to the internet.

[0098] In some implementations, LDs in the vicinity of each other may establish communication with each other via blue tooth, infra-red or other near field communication methods when such communication methods are enabled by the

respective users. A handshake protocol, where a LD that is offline is authenticated through via another LD that is offline, may be carried out. After successful completion of the handshake protocol, the offline LD may receive content shared by the online LD, including updates to any shared collection commonly owned by the online LD and offline LD.

**[0099]** FIGURE 7b shows a logic flow diagram illustrating SCM component set up in an embodiment of the shared discovery of the CDDP. The set up may start at 734, where a server may receive a request from a client device of first user ("sharing user") to share a target content collection with a second user ("shared user") at 736. The target content collection may include a library, a portion of a library, playlist, and/or the like. The share request may include information relating to client details such as client IP address, device type and model, operating system, and/or the like. The request may also include identifying information relating to the sharing user and the shared user. User identifying information may include, but is not limited to, an email address, user name, alias or nick name, address, phone number, and/or the like. The request may also identify the content collection being shared, such as the content collection name (e.g., library name, collection name, playlist name, etc.), and in some implementations, the track identifiers (e.g., Track ID) of the tracks in the specified content collection. The share request, in one non-limiting example, may be in XML format substantially in the following form:

```
<XML>
     <ClientDetails>
          <ClientIP>192.168.22.111</ClientIP>
          <ClientType>smartphone</ClientType>
          <ClientModel>HTC Hero</ClientModel>
          <OS>Android 2.2</OS>
      </ClientDetails>
     <UserDetails>
```

```
            <UserName>JaneSmith@gmail.com</UserName>
            <SharedUser1>JoeKline@gmail.com</SharedUser1>
            <SharedUser2>BillMadd@hotmail.com</SharedUser2>
        </UserDetails>
        <SharedContentDetails>
            <SharedLibraryName>Jane's Jazz Collection</SharedLibraryName>
            <Track1ID>238348</Track1ID>
            <Track2ID>338458</Track2ID>
            .
            .
            .
            <Track50ID>245788</Track50ID>
        </SharedContentDetails>
    </XML>
```

**[00100]** At 738, after receiving the share request from the sharing user, an instance of the specified content collection may be created. Content items may be populated in the instantiated shared content collection file according user specified constraints. At 740, the SCM component may identify content items in the target content collection. In one implementation, the identification may include extracting Track IDs of content items in the target content collection from the XML share request. At 742, the SCM component may any retrieve restrictions on the target content collection. These restrictions may be restrictions on who can view and/or share, when the contents may be viewed and/or shared, where the contents may be viewed and/or shared, and/or the like. In some implementations, these restrictions may be specified by the sharing user. For example, a sharing user may want to make the shared collection a private collection between himself or herself and the shared user. In other implementations, these restrictions may be related to license rights. For example, certain tracks in the sharing user's target collection may be licensed for Japan. The tracks licensed for Japan would be decrypted by the sharing user's LD when the sharing user is in Japan. However, when the sharing user shares such tracks licensed only for Japan with a shared user in the United States, the SCM component may detect the licensing restrictions, and apply such restrictions to the appropriate tracks in the target collection to ensure that shared user

may view and/or share only those tracks that are licensed for his or her own territory, in this example, the United States.

**[00101]** At 744, the SCM component may query one or more media content databases and/or tables for the non-restricted target content collection items, i.e., the target content collection items from which restricted content collection items have been removed. At 746, the SCM component may then retrieve any modification restrictions to be imposed on the target content collection. The modification restrictions may be specified by the sharing user, and may include rights to modify the shared target content collection. Modifications may include adding, deleting or renaming content items or collection, and/or the like. For example, in some implementations, a sharing user may allow adding content items to the shared target content collection, but restrict the sharing user from deleting any items from the target content collection. Selective restrictions may also be possible. For example, a sharing user may allow deletion of any artists other than, for example, "Norah Jones." These modifications may be displayed in the form of options for users to select. The user may also be allowed to craft and apply one or more restriction rules. For example, when a parent is sharing a content collection with a child, the parent may set up rules that, for example, do not allow any tracks having explicit lyrical content or other parental advisories to be added to the content collection.

**[00102]** At 748, the SCM component may then populate the shared content collection file with the results of the query and apply the retrieved modification restrictions. At 750, the SCM component may time stamp the shared content collection file and store the file in one or more shared content database and/or tables. Time

stamping not only ensures that the most recently updated instance of the content collection file is retrieved when requested, but also allows a user to go back in time to retrieve prior versions of the shared content collection. At 752, the SCM component may invite the shared user to access the shared content collection. For example, an invitation email or message within the CDDP (e.g., "Jon wants to have a shared rock collection with you. Do you accept?") may be sent to obtain the shared user's acceptance. If the shared user accepts at 754, the SCM component may confirm with the shared user if he or she would like to merge the shared content collection with her or her own content collection. If the user agrees to merge at 756, the SCM component may obtain the list of content items in the shared user's collection at 758. The SCM component may then compare the shared user's content collection with the shared content collection to identify non-duplicate content items. The identified non-duplicate content items may be added to the shared content collection file at 760. Allowing the option to merge would require that there are no restrictions to add content items. Other view/share restrictions and modification restrictions may be applicable in some implementations. The shared content collection file may then be time stamped and stored in the shared content database at 762. At 764, the most recent shared content collection would be displayed to all shared users.

**[00103]** At 756, in one implementation, the shared user may not agree with the merger, or may be restricted from exercising the merger (e.g., adding to the shared content collection). In this case, the shared user may be provided an option to replace his or her content collection at 772. If the shared user agrees, the SCM component may then replace his or her content collection with the shared content collection at 774, concluding the set up process at 766. However, if the shared user does not agree to the

replacement, the shared content collection will be saved as a separate collection in the shared user's CDDP account at 776. The shared content collection may then be displayed on the user interface of the CDDP application as a separate shared content collection.

**[00104]** At 754, the shared user may not accept the sharing user's invitation to access the shared content collection. In this case, the SCM component may notify the requesting user i.e., the sharing user at 768. At 770, the sharing user may be given an option to select another user to share the target content collection. If the sharing user decides to select another user, the set up process may move to 752. On the other hand, if the sharing user does not want to select another user for sharing, the set up process concludes at 766.

**[00105]** FIGURE 7c shows a logic flow diagram illustrating SCM component update in an embodiment of the shared discovery of the CDDP. Once a shared content collection has been established, the SCM component may maintain and update the shared content collection as necessary. The update process may start at 778. At 780, a user of the shared content collection may request to modify the shared content collection. The request may be initiated when a user attempts to modify the shared content collection. In one implementation, the CDDP application interface may include an icon or button for requesting modification. The modification request may include an identifier for the shared content collection (e.g., SC768765, name of collection, etc.), user identifier, modification type (e.g., add, delete, rename, etc.), content items to be modified, and other relevant information. At 782, the SCM component may check the attributes of the shared content collection for any restrictions, including view/share restrictions and modification restrictions. If the requested modification by the user is

not allowed, the requesting user may be notified at 794. The requesting user may also be provided an option to try again at 796 (e.g., try a different modification or try a different shared content collection). If the requested modification by the user is allowed at 784, the SCM component may make the modification, and then time stamp the modified version of the file before saving it on the shared content database at 786. The determination of whether a modification request by a user is allowed or not may involve examining the attributes for restrictions from 782. Specifically, in some implementations, the SCM component may verify whether the user has the right to modify the content collection and/or whether the modification is acceptable under the restrictions in 782. At 788, the SCM component may check to determine if any of the users of the shared content collection are online (i.e., connected to the CDDP). At 788, when no users of the shared content collection are online, the SCM component update process may end at 798. However, if at 788, one or more users of the shared content collection are online, the SCM component may push the updates to the users' client devices to display the most recently modified shared content collection at 790. In some implementations, the users may be notified of the availability of updates and may be requested to provide approval for pushing the update. At 792, the SCM component may entertain any additional modification requests available.

## Guru Program Component

**[00106]** In some embodiments, the Guru program component helps identify and recognize and/or reward users for the value, whether intrinsic or extrinsic, they deliver. In some implementations, value may be derived directly or indirectly from the activities of Gurus. Examples of value for the CDDP include driving new and/or repeat license sales, enhancing the experience for other users by influencing their music plays, driving

promotions sponsored by partners such as artists, labels, publishers, and/or the like. In some other implementations of the Guru program, driving new and repeat license sales may be deemed a function of enhancing the experience for other users by influencing their music plays. As such, in some implementations, influence may directly correlate with plays.

**[00107]** In one implementation, influence may be any activity carried on by or caused by a user that is responsible for content items played by another user. For example, when a user publishes a playlist, the user's activity may be an influencing activity if another user plays songs from the published playlist or publish notification, follows the playlist and play songs in it, navigate to the user's profile and play songs from the playlist directly from the profile, and/or the like. Similarly, an influencing activity may also include a user sharing a content item such as an artist, album, song, and/or the like, with which another user may end up interacting. Non-limiting examples of such interaction may include a user playing songs from the share notification, clicking through the share and playing songs from the artist or album page, adding the artist, album or song to his or her personal collection (e.g., “My Collection”) and playing songs from there. Other examples of an influencing activity may include a user playing a song, and another user navigating to the user’s profile and playing songs from designated collections such as “Top Artist,” “Most Recently Played,” “Most Frequently Played,” “Top Songs,” and/or the like directly from the user’s profile. The another user may also navigate to the user’s profile and add songs from the designated collections to his or her own collection (“My Collection”) and play songs from the collection.

**[00108]** While there are many examples of influence within a social graph, an interest graph or the wider community of user of the CDDP, not all activities of a user that leads to song play by another user may be considered influencing activities. Table 2 below shows some non-limiting examples of non-influencing activities:

| *ACTIVITY* | *EXPLANATION* |
|---|---|
| Copying | If User B copies the songs in User A's published playlist into one of his or her own playlists and plays songs from there, User A may not get points for plays from the copied playlist. |
| Searching | If User B learns about an artist/album/song/playlist from User A, searches for it, and then plays it or adds it to My Collection and plays it from there, User A may not get points for plays from the search. |
| Multi-User | If User A influences User B who influences User C, User A may not get points for User C plays |
| Related Content Plays | If User A influences User B who plays a song related to the influence, User A may not get points for related plays |

**[00109]** In other alternate implementations, the non-influencing activities from table 2 may be considered influencing activities.

**[00110]** Other activities that may lead to rewards and/or recognition include, without limitation, sharing libraries, playlists and/or knowledge, posting to other users', friends', and followers' comment streams, recruiting new followers and/or friends, suggesting and/or recommending music to friends and/or followers, sharing playlists for followers, friends and/or other, increasing music consumption, reviewing contents (artists, albums, playlists) and posting to content comment streams, and/or the like.

**[00111]** In one embodiment of the Guru program these and other influencing activities may be tracked to recognize and reward users for their advocacy and effort.

Table 3 below list some non-limiting examples of use cases and exemplary data tracked in some embodiments of the Guru program.

| *USE CASES* | *EXPLANATION* | *TRACKED DATA* |
|---|---|---|
| Track plays | Evaluate if and/or how Gurus impact other customers' behavior (e.g., usage volume, range of choice, and/or the like), before and after they begin following;<br>Form an informed profile of Gurus. | Source, track type, access method, track ID, date & time, and/or the like |
| Playlist | Determine if a Guru delivers value to a follower | Playlist creation and/or publishing, following, and unfollowing history, playback frequency, copying of playlists (i.e., becoming an owner), editing, reviews and/or comments, ratings, and/or the like. |
| Sharing | Determine if a Guru is proactively sharing content | Sharing channel, consumer response to the sharing, and/or the like. |
| Purchase | Identify who to attribute a sale of a LD, a CDDP license and/or subscription to. | Purchase history of CDDP licenses, buying process, funnel conversion, and/or the like. |
| Opt-in | Guru accepts invitation to participate in the Guru program and agrees to share data publicly | Opt-in preference. |
| Followers | Evaluate relationship between Gurus and their followers. | Personally identifiable information (PII), user ID, following status, and/or the like. |

**[00112]** As shown in Table 3 above, behavioral, product use, account management, registration, and other information relating to Gurus and/or followers may be tracked. In some implementations, data relating to track plays may be obtained for evaluating if and/or how Gurus impact other users' behavior, before and after they began following one or more Gurus. For example, a Guru shares a track via TWITTER and a non-CDDP

user clicks on a link within the tweet. The link takes the user to the CDDP hosted landing page where he or she buys a license and plays the track. In this case, the Guru who shared the track via TWITTER gets a credit for play, free trial and/or paid accounts. Various user behavior data including usage volume, range of choices, etc., and whether such behavior occurrences are increasing and/or expanding may be tracked for rewarding Gurus, to get more information on product usage, to create and maintain an informed Guru profile, for music intelligence, customer profiling, product feature evaluation, dashboard reporting, marketing response, fraud monitoring, partner reporting and/or the like.

**[00113]** As listed in Table 3, track play detail data for Gurus and/or followers may include, but are not limited to, source, track type, access method, track ID, date and time, and/or the like. A source may include the CDDP library, imported content, shared content (e.g., via email, FACEBOOK, TWITTER, links, etc.), and/or the like and details relating to the sharing user. Track type may include information relating to whether a track is downloaded by the user, downloaded in the smart cache, streamed from the cloud, imported, and/or the like. Similarly, access method may include information relating to how and/or from where the track was accessed. For example, access method may indicate where in the user interface (e.g., library, discovery or community) or from which artist, album, track, playlist, published playlist, chart, offline view, bookmarks, etc., a track was accessed from. Further, track ID may include the track number, associated meta data and/or the like. These data may be collected from the client and/or website.

[00114] In some implementations, Guru playlist related data may be collected for determining if a Guru delivers value to one or more followers. Examples of playlist related data collected may include playlist creation and/or publishing, following and/or unfollowing history, playback frequency, copying of playlist (becoming an owner), editing, reviews and comments, ratings, and/or the like. For example, unfollowing may suggest that the follower did not find any value in a Guru's playlist, while interaction with a playlist may suggest value. Similarly, playlist contributions of followers may be a function of Guru influence. These data, in addition to providing an insight into user behavior and/or product use, may also be useful for music intelligence, customer profiling, product feature evaluation, dashboard reporting, marketing response, fraud monitoring, partner reporting and/or the like.

[00115] In some implementations, sharing data may be collected to determine if a Guru is proactively sharing music. In particular, 1:1 sharing where messages make a single loop may be useful in evaluating how recipients are responding to shared content items. The sharing data may also be utilized to assess if a Guru is stimulating more listening, what channels are being used for sharing, which channel is most effective, and/or the like. Examples of tracked sharing data may include sharing channel, consumer response to the sharing, and/or the like. Sharing channel may include sharing via channels such as email, FACEBOOK, TWITTER, within the CDDP, hyperlink on website or other digital channels, and/or the like. Consumer response may include response of users to the sharing in the form of track plays, track downloads, purchase of tracks, licenses, LDs, and/or the like. In addition to behavior and product use information, these data may also have other uses in customer profiling, product feature

evaluation, dashboard reporting, marketing response, partner reporting, and/or the like. These data may be collected from the client and/or websites.

**[00116]** In some implementations, purchases may also be tracked to identify who to attribute a sale of a LD, a CDDP license and/or subscription. They may also facilitate in determining whether a follower buys more licenses, whether a user buys a LD when his or her old device dies, whether license sales is attributable to a Guru activity, whether a Guru is driving new business, and/or the like. The outcome from these determinations may feed into the Gurus' points and rewards discussed in further detail below. Non-limiting examples of tracked data may include purchase history of CDDP licenses, buying process, funnel conversion, and/or the like. Purchase history may include information including type of license, price, device type, and/or the like. Buying process may include channels and source of traffic such as email, FACEBOOK, TWITTER, within the CDDP, hyperlink on website or other digital channels, and/or the like, as well as funnel conversion. These data may uses in customer profiling, product feature evaluation, dashboard reporting, marketing response, partner reporting, and/or the like. Purchase data may be collected from website registration page(s), account management portals, or from any appropriate locations from the client and websites.

**[00117]** In some implementations, opt-in preference data may be collected from users who accept invitation to participate in the Guru program. The opt-in data may be used for publicly recognizing and rewarding users in the Guru program. In a further implementation, opting in may require the user to agree to share his or her data publicly. Opt-in preference may be collected from the account management portal or relevant web page from where the user may opt in. In one implementation, the default

opt-in value may be "off" and Guru participation may require a user to opt-in in order to change the value to "on."

**[00118]** In some implementations of the Guru program, data on followers may be collected for evaluating relationship between Gurus and their followers. Such data may include, in one non-limiting example, Personally Identifiable Information (PII), user ID, following status and/or the like. Following status in some implementations may include information that may identify whether a user is following another or is being followed by another. In some implementations, Guru and follower user IDs and/or other information may be attached to play events, sale events, or other events. In some implementations, there may be an option to create an alias or nickname that is public facing. These data may be collected from website registration page and account management portal among others. In addition to the Guru program, these data may be used for music intelligence, customer profiling, product feature evaluation, dashboard reporting, marketing response, partner reporting, and/or the like.

**[00119]** In some embodiments, the Guru program may be leveraged by the discovery and social aspects of the CDDP. The point-based system for rewarding users may, in some embodiments, sustain user engagement with the facilities of the CDDP and encourage users to actively listen, share and manage music. In some implementations, "Guru" may be the designation bestowed to those users who may have opted in to the Guru program and are eligible to receive rewards and/or recognition. In other implementations of the Guru component of the CDDP, a user opt-in to the Guru program to earn influence points may be optional. As discussed above, influence points may be earned when one user plays a song due to influence from another user. Each

play by the influenced user may earn the influencing user one or more points or a fraction thereof. In one implementation, when the influencing user earns his or her first point, it triggers a 12 month timer. In some implementations, a time period other than the 12 months may be selected. During the 12 month period, the influencing user may earn points for all plays by the influenced user according to a schedule. An example schedule may, for example, reward the influencing user 1 point for each play by an influenced user during the first month. The example schedule may further stipulate that for the next 2-3 months, each play by an influenced user may earn the influencing user 0.75 points. Similarly, for the next 4-6, the points earned may be 0.5 points, and for the following 7-12 months, 0.25 points. After the 12 month time period, any play by the influenced user would not earn any points for the influencing user. In one implementation, each user that the influencing user influences to play a given song or other content may initiate a separate timer such that the influencing user may perpetually earn points for a given song or other content as long as new users continue to play it. While one specific example of an earning schedule is discussed herein, other variations in the earning schedule are within the scope of the various embodiments of the CDDP.

**[00120]** The Guru program, in some embodiments, may comprise of several levels, each of which corresponds to the number of influence points earned by a user. For example, in one implementation, the Guru program may include a base level and levels 1-5. In some implementations, any user may achieve the base level, but in order to ascend to levels 1-5, a user may need to enroll or opt in to the Guru program. The base level may, in one implementation, be achieved by acquiring a follower, and may be maintained, without opting in to the Guru program, so long as the user has at least one

follower. User who has opted in to the Guru program, on the other hand, may earn influence points and be eligible for levels 1-5. In one implementation, a Guru program user's current level may be determined based on the total influence points earned during the previous 30 day period. In a further implementation, the current level may be calculated periodically, or in a daily basis. As such, a user's influence level may fluctuate periodically, or daily, depending on the total influenced points amassed. Further, when a user stops earning influence points, his or her influence level may steadily decline until the base level is reached. A user may also revert back to the base level, provided there is at least one follower, when he or she opts out of the Guru program. In some implementations of the Guru program, a user's influence points may not be lost or may not expire so long as the user is a member of the CDDP. In a further implementation, this may be true even for those users who opt out of the Guru program, but remain a member of the CDDP service. An exemplary level and point correspondence is illustrated below in Table 4. Depending on the distribution of users, the influence point ranges may be adjusted to achieve a desired distribution (e.g., a normal distribution, as opposed to a skewed distribution).

| *LEVEL* | *INFLUENCE POINTS* | *PREMIUM STATUS* |
|---|---|---|
| 1 | 10-39 | None |
| 2 | 40-89 | Gem |
| 3 | 90-159 | Silver |
| 4 | 160-249 | Gold |
| 5 | 250-449 | Platinum |
| 6 | 450+ | Executive Platinum |

**[00121]** As discussed above, a user's current influence level may be based on the total influence points earned during the previous 30-day period. In one implementation, the Guru program may also track the user's lifetime influence points. In such an implementation, a user with 10,000 lifetime influence points may be a level 1 Guru if he

or she has influenced only between 10-39 plays during the preceding 30-day period. In other implementation, a combination of points earned over a lifetime and over a preceding number of days may be utilized to determine the current influence level of a user. In a further implementation, Gurus may be accorded a premium status based on the accrued influenced points. For example, Gurus may be accorded platinum, gold and silver status based on the accrued influence points.

**[00122]** As discussed above, Gurus contribute towards a more social environment, generate value, and generally uplift the CDDP experience. In return, Gurus enjoy benefits, recognition and/or rewards. All Gurus in the CDDP community may be recognized by the level they have achieved on their profile page and with a level-based icon on their image. Further, a user, by opting into the Guru program and agreeing to allow CDDP to feature himself or herself as music influencers throughout the CDDP experience, may become eligible to be featured in one or more product areas such as the "Music Trends" page, "Music Genre" page, "Music Artist" page, "Music Album" page and/or the like. In a further implementation, the higher the Guru status, the more likely it may be for the Gurus to be featured in relational search results, which may in turn lead to acquiring more friends, followers and influence. Being featured in various product pages, searches and/or interfaces of the CDDP may further reinforce the user's status as a Guru and music influencer. It may also increase opportunities for the Guru to influence other users' plays and earn influence points.

**[00123]** Gurus may also be eligible to earn badges for their influential activities. The badging may be tiered such that it may become progressively more difficult to complete activities and earn badges as a user rises through the tiers. Example badges

may include level badges (e.g., level 1 badge, level 2 badge, etc.), follower badges (e.g., 10 followers, 100 followers, 1000 followers, etc.), influenced play badges (e.g., 10 influenced plays, 100 influenced plays, etc.), and/or the like.

**[00124]** In some implementations, Gurus may receive perks and incentives for their social influence. Through relationships with music labels and other rights holders, Gurus may have opportunities to earn external rewards and recognition related to the content they most heavily influence. Some non-limiting example of rewards include, merchandise, concert tickets, autographed memorabilia, artist meet and greets, and/or the like. Other examples of rewards include invitation to Guru-only offline and online events, such as concerts by artists they support, incentives provided by partners to further promote plays of their repertoires in earning more royalties, monetary incentives such as commissions on a play count basis, and/or the like. Furthermore, in some implementations, the premium status Gurus may be more highly targeted by partners for promotions of artists and songs than others.

**[00125]** FIGURE 8 shows a logic flow diagram illustrating the Gurus rewarding component in some embodiments of the CDDP. In one implementation, for example, the process may begin at 802, with the tracking of user engagement in various activities relating to social, usage, influence, and/or the like at 804. Example activities include posting to other users', friends', and followers' comment streams, recruiting new followers and/or friends, suggesting, referring and/or recommending music to friends and/or followers, sharing playlists for followers, friends and/or other, increasing music consumption, reviewing contents (artists, albums, playlists) and posting to content comment streams, using micro-blog "beats" about their music and related interests,

including providing referrals, recommendations for new music to friends and/or the community. These posts or beats may be limited to 140 characters and may include a bit of text and a link. Comments about content (e.g., artist, album, track, etc.) found in the universal music library may automatically hyperlink to contextual information about that product and ways to further explore that subject.

**[00126]** At 806, a determination as to whether a subject user is enrolled in the Guru program may be made. If the user is not enrolled or has not opted in the Guru program, the user may be reminded at 808 to enroll in the Guru program for rewards and/or status benefits and may conclude the process at 810. However, if the user is enrolled in the Guru program, a determination may be made at 812 whether the user is also engaged in activity whether social, usage and/or influence. In one implementation, each activity may have a corresponding value in status points. At 816, type of activity that the user may be engaged in may be identified and the number of status points associated with the activity type may be determined. For example, a user engaged in recommending playlists that are eventually downloaded and/or played by another user may obtain 2 status points.

**[00127]** In one implementation of the Guru rewards program, the CDDP may increment the user's status points by the determined value at 820. A determination may then be made, based on the incremented status points, whether the user is eligible for a status upgrade at 822. For example, the user may have accumulated 24 status points before acquiring 2 more status points in this instance, causing the total status points to exceed, for example, a cut-off of 25 for silver status. In one implementation, if the user is eligible for a status upgrade, the user's status may be upgraded to the next level at 830

and the user's profile may be updated to reflect the change in status at 824. On the other hand, if the user is determined to be ineligible for a status upgrade, the user profile may be updated at 824, without any status upgrades. The user profile may include published user profile and/or profile in one or more user databases at the backend that is not published.

**[00128]** In another implementation of the Guru rewards program, the CDDP may implement a rewards program that encourages users to engage in a variety of activities, and not merely the kind of activities that have previously had some success. For example, at 826, the CDDP may determine whether the points accumulated for the identified activity exceeds a threshold N. If the threshold is not exceeded, the user's status points may be incremented at 820. However, if the threshold has exceeded, the determined status points may be adjusted at 1228 before incrementing the user's status points by the value of the adjusted status points. Adjustment may include an adjustment by a factor less than or greater than 1.

## CDDP User Interfaces

**[00129]** FIGURE 9 is a schematic view of the CDDP application interface in one embodiment. A user launching the CDDP application may encounter an interface 900 that provides a quick overview of information. The interface 900 may include 905 player control panel, menus 910, a media explorer panel 915, a media display panel 920, information panel 925, and/or the like. In one embodiment, the menu 910 may include menu items such as file, edit, view, controls, share, help, etc. The player control panel 905 may include various controls such as play controls 905a, logos/artwork 905b, current track information 905c, track position bar 905d, volume control bar 905e,

shuffle button 905f, repeat button 905g, search bar 905h, next track information 905i, and/or the like. The media explorer panel 915 may include various selectable items such as music universe 915a, Guru network 915b and offline music 915c. Selection of the music universe item 915a may facilitate the display of information relating to media in the CDDP catalog. As shown in FIGURE 9, wherein the music universe 915a has been selected, the media display panel 920 shows items such as music trends 920b, playlists 920c, Gurus 920d, decade mixes 920e, genre mixes 920f, and any other links to organized content in the music universe. On the right of the interface 900 is an information panel 925 which displays additional information based on selections of items such as 920b-f in the media display panel 920. The information display panel 925 may include several tabs, for example tabs 925a-e. Information corresponding to the selected tab and the selected item 920b-f may be displayed in the information display panel. For example, when music trends items 920b is selected, the information panel 925 is updated to display artists in one tab 925a, albums in 925b tab, tracks in 925c tab, new releases in 925d tab and just added in 925e tab. Similarly, when the Gurus item 920d is selected, the information panel 925 is updated to display information relating to the Guru network. For example, the selection of the Guru network may include a listing of all or some Gurus having the most followers.

**[00130]** The media explorer 915 also include the item Guru network (or "community") 915b. When the Guru network 915b is selected, a community (or Guru) display panel 1000 is displayed, as shown in FIGURE 10. The community display panel may include a profile area 1005 that may identifying user information 1005a, profile image 1005b, and a "my profile" button 1005c. The "my profile" button 1005c display the user's profile information and is discussed in further detail in FIGURE 13. The

community display panel may also include Gurus panel 1010 which may include Gurus suggested by the CDDP, Gurus currently followed, and/or the like. The right of the community display panel 1000 may include one or more panels 1015-1025 displaying activity streams. In addition, the community display panel 1020 may also include a search bar 1020 which may be used to search for Gurus.

**[00131]** FIGURE 11a is a schematic view of the CDDP application interface that is displayed in response to the selection of my profile button 1005c in one embodiment. The profile area 1105 may include buttons 1105a-c to edit profile information, view updates and view suggested Gurus respectively. The profile display panel 1100 may also include shared playlist area 1110 that provides an overview of the playlists that a user has shared with others, or has made available for sharing. Next to each listed shared playlists, the user may click the see tracks button 1110a to explore the tracks in the playlist. Also provided in the profile display panel 1100 is the Guru information area 1120 which may list Gurus that the user follows, as well as other users following the user. On the right side of the profile display panel 1100, an activity stream display panel 1115 may be provided for displaying posts, beats, comments or other messages exchanged between the user and others in the community.

**[00132]** FIGURE 11b is a schematic view of the CDDP application interface that is displayed in response to the selection of edit profile button 1105a in the profile area of the profile display panel 1100 in one embodiment. The edit profile panel 1125 allows the user to edit and/or update identifying information such as name, location, email address, social networks, etc. The user may also select options to integrate with other social networks such as TWITTER and FACEBOOK. In addition, the user may also set

privacy options of his or her profile. For example, the user may make his or her profile public which would let anyone to find the user (e.g., by search), view his or her profile, post items to his or her comment/activity stream, send messages, and/or the like. The user may also specify whether or not to use an approval process to let other users follow him or her. These facilities may no longer apply if the profile is set to be private. Additionally, the interface may also include facilities to set preferences for the activity stream 1125. Examples of such preference settings may include options to select information displayed in the activity stream 1125 in FIGURE 11a to those involving friends having a specified degree of separation, Gurus, followers, and/or the like.

**[00133]** FIGURE 12a is a schematic view of one embodiment of the CDDP application interface. As shown in FIGURE 12a, the media display panel 1205 displays information relating to a selected item (e.g., artist Pink Floyd). The media display panel 1205 may display identifying information 1210, and a listing of tracks 1225 pertaining to the selected item 1210. The user may have the option to create a magic playlist based on the selected item 1210 by clicking on the magic playlist icon 1215. In addition, the user may also share the tracks 1225 with other users by clicking on the share icon 1220.

**[00134]** Next to each track in the listing 1225, is provided a track location indicator 1230. The indicator 1230 may specify using color or other indicia whether or not the track is available in the local/offline library. As shown in the figure, each of the tracks in the listing 1225 may be made available offline by clicking on the make all available offline button 1235. The CDDP, in response to the request to make all tracks available offline, may identify the tracks that are not present in the local or offline library and download them to the user device. Instead of downloading all of the tracks listed at

1225, the user may also individually select one or more tracks for downloaded. Of course, the user may also play, pause or skip these tracks, regardless of whether they reside in the local library or on the cloud.

**[00135]** FIGURE 12b is a schematic view of one embodiment of the CDDP application interface. When the magic playlist icon 1215 shown in FIGURE 12a is clicked, the media display panel 1280 is displayed. Here, the display panel may show the magic playlist 1250 that was created in response to the request. The playlist may identify the creator at 1255 and include options to create another magic playlist or share the playlist with other users. At the media explorer bar 1245, the listing of playlists may be updated to include the newly generated magic playlist. Similar to FIGURE 12a, the media display panel may also list the tracks included in the magic playlist at 1260. In addition, on the right side of the interface, in the information panel 1265, information such as people following the playlist, people who have downloaded the playlist, those who have shared the playlist with others, and/or the like may be displayed.

**[00136]** FIGURE 13 is a schematic view of one embodiment of the CDDP application interface. Here, an artist has been selected as shown in the media display panel 1305. A list of selected tracks (e.g., by popularity) or all tracks related to the artist may be listed in the track listing area 1310. Further, the listing area may also identify the tracks that are located in the local library, and their total number using the location indicator 1310b, and the item 1310a. On the right side of the interface, is the information panel 1320, which may provide additional information on the item displayed on the media display panel 1305. For example, as shown in FIGURE 13a, the artist's main releases are shown in the information panel under the albums tab 1320b. Any of these

albums may be made available offline, used for creating a magic playlist, bookmarked or shared using the options in the popup menu 1320a. Information about the artist may also be displayed by selecting the about tab 1320c. FIGURE 13b is a schematic view of one embodiment of the CDDP application interface of FIGURE 13a after the playlists tab 1320d has been selected. The playlist tab 1330 may provide a listing of all or selected playlists 1340 that include or are similar to the selected item (e.g., artist Janelle Monae) 1335 ordered by relevance, popularity, or any other criteria. Similarly, figure 13c is a schematic view of one embodiment of the CDDP application interface of FIGURE 13a after the item 1320f has been selected. As in the previous figures, the media display panel 1345 displays identifying information on the selected item, as well as a track listing. In addition, the information panel 1350 on the right may display playlists that are related to the selected item, and ordered using or one more criteria such as popularity, published date, relevance, and/or the like.

**[00137]** FIGURE 14 is a schematic view of one embodiment of the CDDP application interface. The interface 1400 shown in figure 14 is rendered in response to the selection of the now playing item 1405a in the media explorer panel 1405. The media display panel 1410 may provide a listing of tracks that are in a play queue. Such a queue may include tracks that were previously played, is currently being played and are in queue for playing next. For example the track 1410a has been selected, and is the track being played as indicated by the indicator 1410b and by the player control panel 1420. Additionally, the information display panel 1415 on the right is updated in response to the selection of track 1410a. The information display panel 1415 may list playlists including the current playing track. Such a listing may be arranged based on one or more criteria such as popularity, preference, recently published, and/or the like.

Discovery User Interfaces

**[00138]** Referring now to FIGUREs 15a-g, in one embodiment of the CDDP, there is shown a sequence of player interfaces as the user explores and discovers music related to an item. In general, the user may discover related music by selecting a displayed item, for example, the photo of Van Morrison at the bottom middle of FIGURE 15a. The CDDP may then generate recommendations of related items based upon the selected item.

**[00139]** Referring again to figure 15a, the user may select an artist ("Van Morrison"), an album of the artist ("Astral Works"), and more specifically, a track in the album ("Sweet Thing"). Referring now to figure 15b, an image representing the track selected may be displayed in a stagelight/spotlight window. Referring now to FIGURE 15c, images representing selected items 1515b-e related to item 1515a may be displayed in the stagelight window 1515. The images displayed in the window 1515 may include an image representing a related track 1515b, an image representing an album 1515c, an image representing another user 1515c and an image representing a playlist 1515d that includes tracks 1515a and 1515b. Referring now to FIGURE 15d, the user may select the track 1520a, in response to which, the stagelight window 1520 is presented. The stagelight window 1520 may display additional information about that selected track 1520a and also albums 1520b in which the track may appear. Similarly, items 1520c-f may also be selected to obtain additional information. In addition, selection of one of the items 15e-f may reveal control options to scroll through other images corresponding to other tracks. The user may simply use click through the images.

**[00140]** Referring now to FIGURE 15e, the stagelight window 1530 is updated to show the user selection of another item ("Speaking in Tongues") image 1530a, causing it

to overlay the item 1520a image of FIGURE 15d. Selection herein may include selecting a stagelight button or icon, double click, single click, right click and select stagelight or drag and drop. The user may now be presented with more information about the selected item 1530a and the images representing tracks, artists, and playlists related to 1520c-e have been replaced with images of an album 1530b ("Kicking Television: Live in Chicago"), an artist 1530c ("Brian Eno") and another user offering playlists 1530d ("Michael") related to item 1530a. In addition item 1530f may show the tracks in the selected item 1530a. Referring now to FIGURE 15f, the user may select the item 1530b ("Kicking Television: Live in Chicago") image from 1530b, causing it to replace the item 1530a image of FIGURE 15e. The user may be presented with more information about the stagelit item 1540a and one or more updated items including 1540b.

**[00141]** Referring now to FIGURE 15g, the user may be presented with a time line of their exploration/discovery sequence in the stagelight window 1550. The top row 1550a is for tracks and includes the track item 1520a from FIGURE 15d. The track item 1520a was the first selected item in time sequence. The second row 1550b is for albums and includes album item 1530a from FIGURE 15e. The album item 1530a came second in time sequence, after the track item 1520a. Similarly the third item selected in time sequence is the album 1540a from FIGURE 15f. Other rows 1550 c-e (in order from top to bottom) are for "artists", "Gurus" (other users like "Tom" and "Michael" with trusted recommendations) and playlists (like "The Sure Thing"). Thus, FIGUREs 15a-g illustrate an exploration/discovery sequence in which the user is provided facilities, via the CDDP stagelight/spotlight user interface, to discover and play music related to an initial musical selection using recommendations of various sources including related tracks, related albums, related artists and trusted advisors (Gurus).

**[00142]** FIGUREs 16a-c are schematic views of the discover stream component in some embodiments of the CDDP. As shown in FIGURE 16a, the discover stream user interface includes a display window 1600. The display window further comprises an input text box 1605 where a user may input a content item name such as an artist, album, playlist, track, and/or the like. As shown in the FIGURE, an artist "depeche mode" is input as a content item seed, and an album view 1605d is selected. The display area 1625 displays a stream of albums of artists similar to "depeche mode." Instead of an album view, users may select other views such as artists or tracks. When a content item seed is provided to the discover stream component, the recommendation engine may take the provided content item seed and generate other content items that are related to the seed. The discover stream component may then stream the related content items, i.e., albums 1615 from the left side of the screen to the right side. At any time a user may click or select an album 1630 as shown in FIGURE 16b. The selection may cause the discover stream component to take the selected album 1630 as an input to the recommendation engine to regenerate an album stream related to the selected item 1630. The selected item may stay stationary while related albums may continuously stream from the left to the right. A user may also hover a curser over an album 1625 to display control icons such as play, stop and pause. In one implementation, the discover stream component may allow the user to play a representative track which may include, without limitation, a track selected at random, the most popular track, a track determined to be most likely of interest to the user by the recommendation engine, the most frequently played track, the most highly recommended track, and/or the like.

**[00143]** In one implementation, the discover stream interface may also keep track of and display all selections made by a user. The bread crumb panel shown in FIGURE

16b shows an icon 1635 of the selected album. Further, FIGURE 16c shows a bread crumb panel 1640 that includes six album selections made by the user. The bread crumb panel establishes a sequential history of the selections made by the user. In one implementation, the user may select any of the album icons and may perform a variety of operations including, but not limited to: play a track, download the album, create a magic playlist, share the album, download the album to a cache memory, download the album to your local client library, and/or the like.

**[00144]** FIGUREs 17a-f are schematic views of the discover lens component in some embodiments of the CDDP. As in the discover stream component of FIGUREs 16a-c, a user may enter a content item seed as an input (for e.g., "depeche mode"). When a track view is selected, the recommendation engine may generate tracks (e.g., track 1710) that are similar to the track 1715 by the artist depeche mode. As shown in FIGURE 17a, the related tracks including track 1710 may be rendered around the seed track 1715. In one implementation, a user may select the seed track 1715 to play the track or add the track in a playlist, download to the client, share with other users, and/or the like. In some implementations, the seed track may be selected based on the user-provided track input. In other implementations, the seed track may be derived from the user provided content seed such as an artist name, album name or a playlist name. In a further implementation, a representative track may be selected for the track view. The representative track may be a track selected at random, the most popular track, a track determined to be most likely of interest to the user by the recommendation engine, the most frequently played track, the most highly recommended track, and/or the like.

**[00145]** When the user selects the track 1710 from FIGURE 17a, the discover lens component interface may be updated to display a collection of tracks as shown in FIGURE 17b. Here the nine tracks from FIGURE 17a are displayed, with track 1715 being displayed in a bounding box. Further, track 1710 is also displayed in a bounding box. In one implementation, a track that was previously selected or is currently selected may be displayed in a bounding box. When track 1710 is selected, the recommendation engine generates related tracks 1710a-e. The user may then continue to select any of the displayed tracks (e.g., track 1710d) and obtain more related tracks. In this way, the discover lens component may facilitate a visual lens like discovery of related content items. Furthermore, as shown in FIGURE 17c, the discovery lens component may also map out the discovery path traversed by the user. For example, from FIGURE 17c, it is clear that the user selected track 1715, track 1710, track 1725 and track 1735 to generate the tracks displayed. In one implementation, the discovery path and the related tracks displayed may provide an indication of how far the user has traveled from his or her initial selection of track 1715 to the last selected track 1735. The distance between track 1715 and track 1735 may visually show the degree of relatedness between the tracks.

**[00146]** In some implementation, the discovery lens component may support clicking and holding the cursor at a location 1745 in the display window farther away from the center (the seed track 1715), as shown in FIGURE 17d. The action may then result in a cluster of related tracks 1750 shown in FIGURE 17e. The cluster 1750 is not only visually farther out from the origin (the seed track 1715), but also in terms of relatedness with respect to the seed track 1715.

**[00147]** In one implementation, the discover lens component interface may include facilities for retrieving and displaying a prior search. FIGURE 17f displays a back/forward icon 1755 that may be utilized to go back or forward a pre-defined number of past searches, even when the searches were carried out in separate sessions. In one implementation, these search results may be stored as a series of numbers in a grid based format, such that with the location of the grid and identifier of the track (e.g., track ID), the entire display of related tracks may be accurately regenerated and displayed for the user. In another implementation, these search results may be stored in an array, which could be used for reproducing the lens map 1765. In a further implementation, the discover lens component may include a share icon 1760. Via the share feature, the user may share the lens map 1765 with other users. In one implementation, the lens map 1765 including the display of related tracks may be shared as an image file (e.g., JPEG, PNG, TIFF, BMP, and/or the like), as a reproducible list, in an email among others. In the case of the reproducible list in an email or in comment stream, the recipient may load the file in the discovery lens component interface and obtain the lens map 1765. Various other features such as zoom 1770 and maximize 1775 may also be available for the user to customize his or her viewing preferences.

**[00148]** FIGUREs 18a-c are schematic views of the discover stacking component in some embodiments of the CDDP. In some implementations, the discover stacking component interface may include a display window 1800, similar to that of the discover streaming and lens components. A user may enter a content item name in the input entry box 1805. In this example, an artist name "depeche mode" is entered. The recommendation engine may then take this input and run its algorithm to identify related albums 1815 (or songs, playlists, artists, etc.). Thumb nails of the identified

related albums 1815 may be displayed on the window. In some implementations, the thumb nails of the album covers may shrink and grow to gain the user's visual attention. In one implementation when a user selects an album 1810 (shown in FIGURE 18a), the selected album may be brought to the forefront and the previously selected album 1825 may be added to the album stack (shown in FIGURE 18b). When the album 1810 is selected, related albums 1820 may be identified and displayed as shown in FIGURE 18b. The user may repeatedly select various albums as he or she is discovering music. As the user continues to select albums, the discover stacking component may continue to provide new recommendations as well as add the last selected album continues to the stack 1840, making the stack 1840 grow as shown in FIGURE 18c. In a further implementation, the discover stacking component may allow the user to peel away albums from the stack 1840 in a manner similar to flipping through a stack of record. In some implementations, facilities for sharing and publishing may be provided to the user.

**[00149]** FIGUREs 19a-g are schematic views of the molecular discovery component in some embodiments of the CDDP. In some implementations, the molecular discovery component interfaces may facilitate content discovery related to their selection. In FIGUREs 19a-d, the center molecule 1905a-d respectively represents the selection. It is also the user's entry point as well as search subject. Surrounding the center molecule are top related results by category for album 1910a-d, artist 1915a-d, song 1920a-d, Guru 1925a-d, and genre 1930a-d. The user may follow a new path of discovery by dragging any result in the surrounding categories and dropping it to the center, where that center molecule becomes the new subject and is surrounded by top results directly related to the category.

[00150] FIGURE 19b shows the song molecule 1920a of FIGURE 19a dragged and dropped into the center molecule 1905a. As a result of this action, the song molecule 1920a becomes the center molecule 1905c as shown in FIGURE 19c. The molecular discovery component then generates top results for the surrounding categories 1910c, 1915c, 1920c, 1925c and 1930c based on the search subject 1905c. FIGURE 19d shows the resulting display after the song molecule 1920c (from FIGURE 19c) is dragged and dropped into the center molecule 1905c. As shown in FIGURE 19d, the top results for the surrounding categories 1910d, 1915d, 1920d, 1925d and 1930d are also refreshed to reflect the new search subject 1905c.

[00151] In some implementations, the molecular discovery component may include facilities for sharing, adding to playlist, downloading to local client, publishing, creating a magic playlist and/or the like. For example, in FIGURE 19e, several bubbles for share 1940, add to playlist 1950 and download 1945 are shown surround the center molecule 1955. The bubbles may be displayed when the user selects or hovers over the center molecule. The center molecule may then be instantly shared, added to a playlist or downloaded by an action such as drag and drop. FIGURE 19f shows a schematic view where the center molecule 1955 is being dragged and dropped into the bubble for download 1945. As a result of this action, the molecular discovery component may download the item in the center molecule in the user's local client. In some implementations, the center molecule and/or surrounding molecule items that are non-local may be automatically cached in the local client.

[00152] In some implementations, the molecular discovery component may track the search subjects in the center molecule over time and display an interactive historical

crumb trail as shown in FIGURE 19g. The historical crumb trail 1980 may include a scroll bar 1975 which may be scrolled forward or backward to view the search subjects 1960, 1965 and 1970. In a further implementation, the historical crumb trail may not only show the historical path taken by the user, but also a predictive path forward. The predictive forward path may be determined by the music intelligence component based on the user's past listening history, preferences, interest and/or social graph, Gurus, and/or the like.

**[00153]** In some other implementations, the molecular discovery component may also include an interface for sharing playlists or other content items with other users. An example interface is illustrated in FIGURE 19h. The playlist items 1990 are shown on the left, while a list of the user's friends 1995 are shown on the right. In some implementations, the interface may include an option to select other content items such as artists, albums, songs, libraries, collections, and/or the like. Similarly, in some implementations, there may be granularity in selecting friends (e.g., all friends, n degree of friends, family, co-workers, and/or the like). In the implementation shown here, the user may select a playlist item 1998 and may drag and drop the playlist item 1998 to any friends he or she desired to share his or her playlist with.

## Mobile Application User Interfaces

**[00154]** FIGUREs 20a-n are schematic views of the mobile application user interface in some embodiments of the CDDP. FIGURE 20a shows artist view of the collection interface 2005. The interface 2005 includes a navigation bar 2005, buttons 2005c-d, a display panel 2005e and a tab bar 2010. When the collection icon 2010a is selected along with one of the artist, album or track button, a table view of the selected

artist, album or track is displayed in the display panel 2005d. Referring now to FIGURE 20b, when a user performs a swiping action over an artist item (e.g., Madonna), the artist view may expose functionality such as play/pause 2015a, download 2015b, add to playlist 2015c, share 2015d, and/or the like.

**[00155]** Referring to FIGUREs 20c, when a search icon 2025a in the tab bar 2025 is selected, the search navigation bar 2020, along with buttons 2020a-d, a search bar 2020e and a table view 2020f may be rendered. As shown in the figure, when the artist button 2020a is selected, and a search item "Boston" is entered in the search bar 2020e, the results 2020f may be displayed in table or other views. As shown in FIGURE 20d, a similar search may be conducted for the album view 2030a. For example, an album name "Elvis Presley" may be entered in the search bar 2030b, and search results 2030c in album view may be displayed in the display pane.

**[00156]** Referring to FIGURE 20e, when a user selects an artist ("Boston"), the interface 2035 may be rendered. Options for several views including album 2035b, tracks 2035c, biography 2035d and related items 2035e may be provided. As shown in FIGURE 20e, when the album view 2035b is selected, information about the artist may be displayed in area of the display panel 2036. In addition, options to view saved, local and beyond albums may be available. When the saved view 2035f is selected, the display area 2038 displays only those albums that have been saved or bookmarked. When the local view 2035g is selected, the listing in 2038 includes only the albums that are available locally, the albums being stored in the memory of the mobile device. Similarly, when the beyond or cloud view 2035h is selected, the entire list of albums released by

the selected artist ("Boston") and available in the CDDP catalog may be displayed in table view in the display area 2038.

**[00157]** FIGURE 20f is the schematic view of the interface 2035 from FIGURE 20e after the selection of the related view 2035e. This related artists view 2040 may display in table view or other format, artists that are similar to the selected artist ("Boston") in a display panel portion 2040a. In addition, influences of the selected artist ("Boston") may also be provided in another display portion 2040b.

**[00158]** Referring to FIGURE 20g, when a user in an album view swipes an album ("Oracular Spectacular"), the interface 2045 is displayed. The user has the option to go back to the last view by tapping on the last view button 2045a (last view was artist view and is labeled by the name of the artist "MGMT"). The user may also be provided with options to select track view 2045b which displays identifying information related to the selected album in a display panel portion 2045h and a control bar 2045d for play/pause, download, add to playlist, share and other functionalities. Additionally, a location status bar 2045e may also be provided, from where the user may select saved, local or beyond/cloud views of the tracks in the selected album. For example, as seen from the status bar 2045e, 3 tracks from the album have been saved or bookmarked, 3 tracks of the album are available locally, and similarly, 10 tracks of the album are available in the cloud catalog. The tracks corresponding to the status bar selections may be displayed in table view in the display portion 2045h. The description view 2045c may display information relating to the album and/or artist. Referring now to FIGURE 20h, the interface 2050 displays an album track list in cloud view similar to FIGURE 20g. Also shown next to track 4 is a caching icon 2050a indicating the track being played/cached.

**[00159]** Referring now to FIGURE 20i, as indicated by the navigation bar and the selected playlists icon 2055d in the tab bar, a playlists view 2055 is displayed. The interface includes a listing of playlists 2055b ("my playlists") and a listing of magic playlists 2055c. For each playlist, information such as sharing status (public/shared or private) and the number of tracks included may be identified. There may also be an option for the user to add or create playlists using the icon 2055a on the top left corner of the interface.

**[00160]** Referring now to FIGURE 20j, the user may explore any of the playlists displayed in the playlists view of FIGURE 20i. Here, the playlist "80s Dance" has been selected. In this view, a saved option 2060a, a local option 2060b and a beyond/cloud option 2060c on a location status bar are displayed for selection. In addition, the cloud view of the tracks in the playlist is shown in the display panel portion 2060d.

**[00161]** FIGURE 20k is a schematic view showing the now playing track in one embodiment. The interface 2065 includes a navigation bar 2065a, with a back button 2065b to go to the last selected item and a playlist icon 2065c which when selected causes the interface shown in FIGURE 20l to be displayed. FIGURE 20l, as discussed, shows the playlist view with the track 2070b that is up next highlighted.

**[00162]** Referring to FIGUREs 20m-n, some embodiments of the mobile application platform may include settings for configuring the download manager and user settings. Shown in FIGURE 20m is the download manager interface 2075. The download manager interface may include options to enable or disable downloading by sliding or tapping button 2075a. Additionally, the current download status may also be identified at 2075b. Examples of status include downloading, completed, not started,

paused, canceled, error etc. The interface may also display a download queue 2075e that lists the tracks that are in queue for downloading. As shown in FIGURE 20m, the item that is currently being downloaded is identified by the icon 2075f. The download manager interface may also include options to edit the download queue using the edit button 2075c. Editing may including changing the order of the tracks in the queue by simple swiping motions, deleting/canceling selected tracks from the queue, etc. Additionally, the cancel all button 2075d may be used for canceling the download of all the tracks in the queue.

**[00163]** FIGURE 20n is a schematic view showing the user settings management interface 2080. The settings management interface may be launched from the settings option 2080e on the tab bar. Using this interface, a user may configure his or device to manage synchronization, memory usage, network usage, and/or the like. As shown in FIGURE 20n, the sync now option 2080a may be selected to synchronize playlists between the device and the cloud or another device. For example, the user may create a playlist in his or her mobile device. This playlist may be saved locally in the device memory until the user selects the sync now option. As a result of the syncing, the playlist may be saved in his or her beyond/cloud account. Additionally, the playlist now stored in the beyond/cloud account may be downloaded/ synced with one or more LDs.

**[00164]** The settings interface may also be utilized to configure cellular data use. Cellular data plans subscribed by users may vary. While some users may have unlimited data plan, others may have a limited monthly plan (e.g., 2 GB/month) and may like to limit the amount of data downloading. In such a situation, the user may set on or off the remote browsing 2080b, remote playback 2080c and track downloads 2080d.

Content Identification Component

**[00165]** In one embodiment of the CDDP, facilities may exist for incorporating a user's existing collection of music tracks to the CDDP music library ("beyondization"). The user may opt in to the beyondization service to obtain copies of some or all of his or her existing tracks in one or more formats at a variety of bitrates selectable by the user. The user may also choose whether to hold on to their existing files, back them up, or delete them (e.g., to save disk space). Benefits offered by beyondization may include opportunity to replace low quality tracks with higher fidelity versions and/or replace tracks that have missing metadata. In one implementation, tracks that have been beyondized may be shared or duplicated as only LDs may be able to play tracks obtained from the CDDP library. However, in other implementations, when the user chooses to not beyondize, the CDDP may not support sharing, duplicating, playlist creating, etc., activities utilizing the CDDP.

**[00166]** FIGURE 22a is a data flow diagram of an example content identification component in some embodiments of the CDDP. Content identification may be initiated at the devices 2202 with existing audio or other media files. In one implementation, a request to identify content items from the device 2202 may be sent to the music intelligence component 2206. The request message may packaged as an HTTP(S) POST message and may include information such as acoustical fingerprints and metadata of each file on the client. An example content identification request message 2204 may be in XML format substantially in the following form:

```
POST /beyondization.php HTTP/1.1
Host: www.websitename.com
Content-Type: Application/XML
Content-Length: 1306
<?XML version = "1.0" encoding = "UTF-8"?>
<Beyondization>
```

```
            <Username>dingdong555@gmail.com</Username>
            <Timestamp>20xx-02-22 15:22:43</Timestamp>
            <ClientDetails>
                   <ClientIP>192.168.23.126</ClientIP>
                   <ClientType>smartphone</ClientType>
                   <ClientModel>HTC Hero</ClientModel>
                   <OS>Android 2.2</OS>
                   <AppIinstalledFlag>true</AppInstalledFlag>
            </ClientDetails>
            <TrackDetails>
                 <FingerprintID1>ABF6789</FingerprintID1>
                 <FingerprintID2>ASF6H88</FingerprintID2>
            .
            .
            .
                 <FingerprintID78>A7GHK33</FingerprintID78>
            </TrackDetails>
            <MetaData>
               <Track1>
                   <genre>blues</genre>
                   <artist>Blue man</artist>
               </Track1>
            .
            .
            .
               <Track78>
                   <album>Nevermind the Wishkaws</album>
                   <songtitle>smells like</songtitle>
               </Track78>
            </MetaData>
</Beyondization>
```

**[00167]** In one implementation, the music intelligence component 2206 may perform acoustical analysis on the fingerprints and metadata matching of the obtained files at 2208. At 2212, for each identified file, the music intelligence component may determine the corresponding track ID. In a further implementation, for files that are not recognized, or that are not present in the CDDP catalog, a new track ID may be generated. In a further implementation, one or more metadata database and/or tables may be periodically queried for identifying the unidentified files. In one implementation, the generated track IDs may be sent in a HTTP(S) POST response message 2214 to the client 2202 for play count recording and/or other customer usage recording purposes. An example response message 2214 may be in XML format substantially in the following form:

```
POST /beyondization.php HTTP/1.1
```

```
<XML>
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          .
          .
          .
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**[00168]** FIGURE 22b is a logic flow diagram illustrating an example content identification in some embodiments of the CDDP. The beyondization may begin at 2205 with the search for media files in a user's client device at 2210. In one implementation, the search may be conducted only after verifying that the user has opted in to the beyondization service. The verification may be performed by requiring the user to confirm beyondization (e.g., click to confirm beyondization) or informing the user of the option to beyondize (e.g., want to beyondize your tracks?). At 2215, the media files may

be analyzed. The analysis may include aggregating the media files, examining the files for information for metadata, bitrates, and/or the like. At 2220, each media file may be identified using information such as filename, ID3 tag or other metadata containers, hash value, acoustic fingerprint, and/or the like. If any media file is unidentified at 2225, the user may be prompted to enter the file information or skip the file at 2230. In one implementation, if a media file is not in the catalog as determined at 2235, the fingerprint and/or other identifying information relating to the file may be logged in one or more user media databases and/or tables at 2240. The media file may then be included in the user's local or offline media library at 2245. At 2250, some media files may also be found in the catalog. Those media files may be analyzed to determine whether the catalog version of the file is of higher fidelity than the local version at 2255. Similarly, if all media files are also in the catalog as determined at 2235, a further determination as to whether the catalog version of the file is of higher fidelity than the local version may be made at 2255. If the catalog version of the file is of higher fidelity, the user may be prompted to confirm the replacement of the local file with the higher fidelity version from the catalog at 2260. If the user confirms the replacement at 2265, the media file may be replaced with the catalog version at 2270 or the local version of the file is determined to be of higher fidelity as determined at 2255, the fingerprint and/or other identifying information relating to the file may be logged in the user media database and/or tables at 2285 for inclusion in the user's offline or local library at 2290. In one implementation, the user may decide to obtain a higher fidelity version of the file while keeping his or her personal copy of the file at 2275. In this case, the higher fidelity file may be downloaded and the user's personal copy may be backed up.

Content License Acquisition Component (CLAC)

**[00169]** The CDDP in its effort to grow its collection and its user base seeks to improve services and facilities as well as add media that users may want to consume. In one embodiment, the CDDP employs crowd sourcing to automatically detect and initiate acquisition of rights for tracks catering to users' interests.

**[00170]** FIGURE 23 is a logic flow diagram illustrating an example content license acquisition component (CLAC) in some embodiments of the CDDP. The process may start 2305 at 1402, with the receiving or retrieving of play count data at 2310. The play count data may be initially received from LDs that periodically or in real time report to the servers play data relating to each played tracks. At 2315, the play count data may be analyzed to determine any unlicensed tracks. The analysis may include, for example, examination of the tracks including track ID or other identifying information relating to the track. The analysis may further comprise checking the CDDP media databases and/or tables to determine if corresponding records of the tracks are present. Based on the analysis, a determination may be made as to whether any of the tracks being reported are unlicensed tracks. In one implementation, such tracks may be uniquely resolved within the CDDP collection and may be provided a track ID upon identification. If there are no unlicensed tracks identified at 2315, the process may end at 2345. However, for the identified unlicensed tracks, the CLAC may determine if the unlicensed tracks are popular with users, and if so, may automatically initiate a rights acquisition process. In one implementation the CLAC may obtain aggregate play count data for each unlicensed track over a period of time (e.g., a week, month, etc.). The play count data may be aggregated from one or more users of the CDDP. In a further implementation, the CLAC may also obtain aggregate play count data for all licensed

tracks from one or more users of the CDDP for the same period of time. The CLAC may also retrieve one or more rights acquisition trigger rules to evaluate the obtained aggregate play count data. In one implementation, rights acquisition may be triggered when the aggregate play count for the licensed track exceeds a threshold (e.g., play count greater than 500). In another implementation, any unlicensed tracks with a non-zero play count may trigger rights acquisition. In yet another implementation, rights acquisition may be triggered when the aggregate unlicensed track play count is greater than a predefined percentage of the aggregate play count data for all licensed tracks. At 2320, if the rights acquisition is not triggered, the process may end at 2345. At 2320, if the rights acquisition is triggered, the CLAC may identify the unlicensed track using, for example, fingerprint, ID3 tag, etc., at 2325. Using the obtained information, the CLAC may the query a rights database at 2330 to obtain rates, quotes and/or availability for licensing rights. If there is an opportunity for obtaining rights for the unlicensed tracks at 2335, the CLAC may identify the appropriate rights clearing association such as ESCAP, BMI, SESAC, and/or the like at 2350. At 2355, the identified rights clearing association may be requested to provide rates, quotes and/or authorization to add the track to the CDDP catalog. If the request is approved at 2360, the added track may be added to the online catalog at 2365 and made available to the users of the CDDP. If at 2360, the request is not approved, the CLAC may periodically request rates, quotes, and/or authorization to add the track to the CDDP catalog at 2365. The process may end at 2345.

**[00171]** At 2335, if there is no licensing opportunity available, the CLAC may periodically query rights database for rate and/or availability at 2340. In one implementation, the rights database may be constantly updated as more tracks are

licensed or are offered for licensing by partners. In one implementation, even if the rights holder cannot be identified, the CLAC may upload the unlicensed tracks to one or more servers. In some implementations, the servers may be selected based on the geographic location where the demand for the track is the highest. For example, if users in the UK are playing an unlicensed track from a music artist, a copy of the track may be uploaded to servers at or near the UK. Royalties and/or license fees for the uploaded but unlicensed track may be collected for payment upon formalization of the licensing arrangement. In this way, licensed tracks may be readily provided to the users of the CDDP, while protecting royalties owed to partners.

License Management Component (LMC)

**[00172]** The CDDP provides users an unlimited access to a comprehensive catalog of multimedia content to use and share, while protecting the commercial interests of content owners, OEMs and network operators at the same time. This is facilitated by the use of Digital Rights Management (DRM) and other security technologies. The CDDP facilitates protection of the interests of content licensors through secure play count reporting. Through the use of play count reporting, royalties can be calculated and properly attributed to partners. Through DRM, the CDDP ensures that content is only playable in its territory of licensing and protects the interests of OEMs by ensuring that users can only play content on LDs. Within the CDDP ecosystem, the DRM may not inhibit using and sharing content. For example, the DRM may place no limits on duration of a user's music ownership, methods of sharing (including email, portable storage devices, drop box, etc.), the number of licensed devices that a user can own, playback quality, and/or the like.

[00173] In one implementation, the CDDP may leverage DRM technology for supporting a wide range of consumer electronics that can play multimedia content, from minimal "shuffle" type devices all the way up to desktop PCs. In a further implementation, the CDDP DRM may provide portability to a wide variety of operating platforms, including, but not limited to, broadly available OSs (e.g. Windows, Linux, Android) as well as proprietary operating platforms (e.g. Samsung BADA). In some implementation, the CDDP DRM may provide strong support for connected portable devices, to eliminate tethering to PCs through side-loading, enhancing the user experience and making the ecosystem more attractive to mobile operators. In addition, the CDDP DRM may utilize robust, field-recoverable security to eliminate or minimize the impact of hacks or other security concerns.

[00174] In yet another implementation, the CDDP DRM may facilitate flexible domain authentication, so that rights may be configured on groups of devices ranging from all devices owned by a single user up to all devices in a territory of licensing (e.g., country), thereby increasing flexibility of content usage and licensing. In one implementation, CDDP DRM may include DRM technologies developed by third parties (e.g., Marlin DRM). Many modern DRM technologies include a "root of trust" organization that may issue security material such as device certificates and encryption keys. Root-of-trust services also facilitate defining robustness rules for DRM implementations in order to thwart hacks on susceptible devices, and DRM implementers must adhere to these rules as part of their technology licensing agreements. The Marlin Trust Management Organization (MTMO) serves as the root of trust organization for Marlin. Marlin DRM uses a graph theory-based rights model, which consists of links and nodes. Nodes may represent concrete entities such as users,

devices, and servers, or abstract entities such as domains (e.g., groups of users) or subscriptions (e.g., rights to content). Links may represent relationships between nodes. In order for a device to get permission to exercise rights to content (e.g., to play it), the device must connect through links to a node corresponding to the user licensed to access that content on that device. The LMC of the CDDP may leverage user nodes to authenticate content according to territories of license (e.g., countries), device personality nodes, corresponding to LDs, subscription links, referring to time-bounded licenses to all content, and/or the like. In one implementation, the CDDP may use user IDs to bind users to devices, to ensure that only the original person who bought the LD (or otherwise obtained it, e.g., got it as a gift) has access to the universal library. All compliant devices in a given geography may access content licensed for that geography. There is no need to limit the number of devices that a user may use, because each device represents a separate fee structure and royalty stream for content owners. The geographic licensing scheme may further facilitate royalty reporting component to determine which royalty scheme is to be used to calculate payments.

**[00175]** FIGURES 24a-b are data flow diagrams illustrating example license management components in some embodiments of the CDDP. As shown in FIGURE 24a, at 2418, a client device 2404 may send account information obtained from user registration along with a registration token the API service 2412 of the LMC of the CDDP. The API service 2412 may receive and validate the token and create a user account for the user of the device 2404 at 2412. At 2422, the client may also request and obtain from a key distributor component of LMC (e.g., SeaCert) Network Mobility (NEMO) keys and device personality ("octopus" personality). The client may securely store the NEMO keys and may utilize NEMO protocols for obtaining keys. At 2424, the

client may send device personality ID to the API service 2412. At 2426, the service database 2414 may associate user and device with license and appropriate territories. At 2428, the user, device and license information may be sent to the DRM database 2416. At 2430, the client device may request an action token from the client DRM service 2410. At 2432, the client DRM service 2410 may allocate user node at 2432, may determine subscription node IDs for territories where user and/or device is licensed for at 2434. At 2436, an expiration date for device to user link may be determined. The requested action token may then be generated and returned to the client at 2438. At 2440, the client may then send the action token to the DRM service 2406. The DRM service 2406 may perform secure protocol processing at 2442 At 2444, the DRM backoffice service 2408 may validate any requests for keys to ensure that the requests are consistent with user and/or device license. At 2446, the DRM backoffice may obtain keys for user and subscription nodes and provide them to the DRM service which may create user node, subscription node(s) and links at 2448. The created user node, subscription nodes and links may then be sent to the client at 2448. The client may receive and store the nodes and links obtained from the DRM service. The nodes and links facilitate the client to play content licensed for appropriate territories at 2450.

**[00176]** FIGURE 24b illustrates example "octopus" graphs 2454 and 2456 for two users Ryuu and Mary respectively. In one implementation, the graph identifies the subscription nodes 2454a, 2456a, the user nodes 2454b, 2456b, the user devices 2454c, 2456c as well as the links 2454d, 2456d between the user and the device. As shown in the figure, each link may be associated with an expiration date and/or time. Each content item 2452 may include a license portion 2452a and a content portion 2452c that is encrypted with content encryption key. In this example, the license portion includes a

content encryption key encrypted with Japan territory's key and Australia territory's key. From graph 2454, the user Ryuu has a subscription node for Japan territory, and as long as the device to user link has not expired, the client on Ryuu's device may retrieve the Japan territory's key, decrypt the content encryption key and decrypt the track. However, the graph 2456 shows that the user Mary has subscription node for the USA. As the content item does not include license for USA territory, the client of Mary's device may not access the keys necessary to decrypt the track. In this way, using the subscription node, user node, device node and user-device link, only contents licensed for a user/device and territory may be decrypted.

**[00177]** FIGURE 24c is a logic flow diagram illustrating an example license management component in some embodiments of the CDDP. In one implementation, the process may start at 2460. The player interface may be initialized at 2462. At 2464, the client may determine whether the device to user link is expired. If the device to user link is expired, the key necessary for decrypting the content encryption key and decrypt the tracks may be discarded at 2464. The process may conclude at 2466. However, if the device to user link is not expired, the client may request an action token at 2468. Action tokens may be requested periodically by the client to ensure user, device and subscription nodes are valid. If the client does not need to request the action token, the player initialization may be completed at 2470. In one implementation, if the client requests an action token at 2472, the request is received by the DRM server at 2474. The server may then check whether the user to device link is expired at 2476. If the user to device link is expired, a notification may be sent to the client indicating that the request is invalid at 2478. The client may receive the notification at 2480, concluding the process. In one implementation, if the user to device link is not expired, the server may

determine if a play count report has been received since the link was last issued at 2482. If the play count report has not been uploaded to the server, a request may be sent by the server to the client for the latest play count update at 2495. The request may be received by the client at 2496 and the client may provide a response at 2497. If the client fails to provide a valid play count report at 2498, the client may be notified of the invalid request at 2478. However, if the play count response is valid, or if the play count report was received since the issue of the link at 2482, the server may determine a new expiration date for the device to user link at 2484. At 2486, a new action token for the device to user link may be generated and send to the client. The client may receive the action token at 2488 and may send the token to the server at 2490. The server may receive the action token and may validate the request at 2492. The server may then create a user to device link and send the link to the client at 2494. The client may receive and securely store the link and discard the old one at 2493. The client may then retrieve the key necessary to decrypt content.

## Encryption- Free Content Purchase Component

**[00178]** In one embodiment of the CDDP, an encryption-free content purchase component (ECPC) may be provided to facilitate legal purchase of DRM free content items. In one implementation, a user of the CDDP may have the option to select an option to purchase a selected track, album or a playlist from the CDDP player. Using information provided by the user (e.g., a user ID and/or password), and/or user provided payment information, a transaction for the DRM free content purchase may be completed. In one implementation, the purchase price of the content item may be discounted based on social influence. For example, if the user has opted in to a Guru program, and has achieved a threshold number of influence points (e.g., 500), the user

may be offered a discount on the purchase price of the DRM free content. In another example, if the item to be purchased is in a playlist published by the user, the purchase price may be discounted for every x level or degrees of separation of people that subscribe and/or add the song and/or playlist to their library. In yet another example, when a threshold number of plays of the content item is reached, the discount may be offered. In one implementation, the threshold number of plays may be reached by the user alone. In another implementation, the threshold number of plays is an aggregate number of plays from one or more users. In one implementation, discount may be provided to a user when a threshold number of plays of the content item and/or number of people that play or buy the content DRM free after discovery from people discovering the content from the user's playlists or library is reached.

**[00179]** FIGURE 25 is a data flow diagram illustrating an example usage reporting component in some embodiments of the CDDP. At 2502 various user actions such as play, pause, etc., are recorded by the client. At 2504, the accumulated user action activity and play count activity may be periodically delivered via secure protocols such as HTTP, SOAP, NEMO, etc., to the DRM service. At 2506, secure protocol processing may be performed before sending a play count service request (e.g., HTTP, XML) to a DRM backoffice service at 2508. The DRM backoffice service may update last play count delivery time for device in the DRM database at 2510. The obtained activity report from the client may also be placed on a play count reporting queue 2520 at 2512. An acknowledgement of successful receipt of the play count report may be sent to the client at 2512. A play count queue processor may then identify various processing components and send reporting data for further processing (e.g., 2516 in music intelligence processor and 2518 in royalty processor).

**[00180]** FIGURES 26a-b are logic flow diagrams illustrating example play count reporting components in some embodiments of the CDDP. As shown in FIGURE 26a, the client side play count reporting may start at 2602. At 2604, a session may be launched (e.g., the client may be launched). In one implementation, a log may be created to initiate set up. Set up may include passing identifying information such as username or email address to the server. At 2606, if an event (e.g., song started, song paused, song resumed, etc.) is detected, the event may be recorded in a log at 2608. Each event record may be associated with identifying information such as username, track ID, time stamp, etc., at 2610. At 2612, the user's profile settings may be retrieved to determine whether event data should be saved to the profile. In one implementation, if the user opted to forego saving event data in his or her profile, the event data may be anonymized at 2618 such that event data may not be used to identify the user. At 2614, a determination may be made whether threshold event capture has been triggered. Examples of threshold event capture triggers include reaching a threshold size limit of the log, number of play counts, time since last event capture, type of event, and/or the like. If the threshold event capture is triggered, the log in the client device may be synced with the log in the server device by sending event and/or other data to the server at 2616. If on the other hand, connection to the server is not available, the event data may continue to be logged if there is another occurrence of an event at 2620. If there are no events (e.g., application is closed), the log file may be closed and the session may end at 2622.

**[00181]** As shown in FIGURE 26b, the server-side play count reporting may start at 2650 by receiving event data at 2650. The event data may include information such as track ID, time at which a song started, ended, was paused or resumed, username,

and/or the like. At 2654, information such as event type, track ID, time stamp, etc., may be extracted from the received event data. Using the extracted information and one or more business rules, play count for each track ID in the event data may be determined. An example business rule may include, for example, a rule which classifies a track that was played for at least x seconds (e.g., 30 seconds, 45 seconds, etc.) as a "play event." Using the time stamp for each event (e.g., song started, song paused, song resumed or song finished) and the business rule, play count for each track may be determined at 2656. In one implementation, the event data may be anonymized with references to any identifying user information removed. If the event data is anonymized as determined at 2658, the reporting database is updated with determined play count data at 2664. On the other hand, if the event data is not anonymized, user identifying information such as username, user ID, social graph, interest graph, etc., may be extracted, obtained and/or derived at 2660. At 2662, the user profile may be obtained and updated with play count and track data at 2662. As in the case of anonymized data, the reporting database may be updated with play count data at 2664. In one implementation, a category of activity for each event may be determined at 2666. Example categories may include point generating activity, royalty activity, recommendation engine activity, and/or the like. At 2668, the event data may be added to one or more databases and/or tables corresponding to the determined activity. At 2670, if there is another event in the queue, the processing for the event may begin at 2654. If there are no other events in the queue, the process may end at 2672.

Usage Payment Collection and Apportionment Component (UPCAC)

**[00182]** FIGURE 27 is a logic flow diagram illustrating an example usage payment collection and apportionment component (UPCAC) in some embodiments of the CDDP.

The process may start at 1702 by receiving a royalty report request at 2704. In one implementation, the report request may include reporting criteria and/or categories. Examples of reporting criteria and/or categories may include, for example, a statement for a selected period of time (e.g., weekly, monthly, from/to, etc.), report by track, by artist, by song, by album, by territory, partner name, activity category, etc. Yet other examples of reporting criteria may include, but are not limited to: total number of end users, number of end users by device type (e.g., users with more than one device may count more than once), number of new end users, number of new end users by device type, number of active users (e.g., users who have one or more plays or downloads during a period of time), number of active users by device type, number of active downloaders (e.g., users who have at least one download during a period of time), number of active downloaders by device type, market share of downloads by device type for a partner, total downloads of all label content by device type, total digital downloads by device type for a partner (e.g., SME, EMI, WMG, etc.), total number of active listeners, market share of plays by device type for a partner, total plays for all label content, total number of playlists created, usage code (e.g., streaming, interactive radio, tethered plays, juke box, portable, etc.) and/or the like.

**[00183]** At 2706, if no reporting criteria and/or categories are provided, default criteria may be selected at 2720. An example default criteria may be last statement available. However, if reporting criteria and/or categories are provided, for each provided criteria and/or category, the UPCAC may, at 2708, query a reporting database using the provided criteria and/or category to obtain matching tracks. In one implementation, no tracks matching the reporting criteria and/or categories may be obtained from the query at 2710. In this case, at 2722, the UPCAC may notify the

requestor that no royalties are due for the specified criteria and the logic flow may conclude at 2724. In an alternate implementation, one or more tracks matching the provided criteria/categories may be obtained at 2710. At 2712, the play count data for each of the identified tracks may be retrieved. At 2714, a royalty database may be queried to obtain rates associated with tracks and/or partners. At 2716, royalty payments may be calculated based on the play count data and the obtained rates. Further at 2718, the requested royalty report may be generated and provided. The report may include, in one implementation, a listing of tracks matching the provided or default criteria and/or categories as well as the royalty amounts due per track. In one implementation, the play count data may be segmented according to territory, and royalty rates for each territory may be retrieved to determine the total royalties owed.

## CDDP Controller

**[00184]** FIGURE 28 shows a block diagram illustrating embodiments of a CDDP controller. In this embodiment, the CDDP controller 2801 may serve to aggregate, process, store, search, serve, identify, instruct, generate, match, and/or facilitate interactions with a computer through various technologies, and/or other related data.

**[00185]** Typically, users, which may be people and/or other systems, may engage information technology systems (e.g., computers) to facilitate information processing. In turn, computers employ processors to process information; such processors 2803 may be referred to as central processing units (CPU). One form of processor is referred to as a microprocessor. CPUs use communicative circuits to pass binary encoded signals acting as instructions to enable various operations. These instructions may be operational and/or data instructions containing and/or referencing other instructions

and data in various processor accessible and operable areas of memory 2829 (e.g., registers, cache memory, random access memory, etc.). Such communicative instructions may be stored and/or transmitted in batches (e.g., batches of instructions) as programs and/or data components to facilitate desired operations. These stored instruction codes, e.g., programs, may engage the CPU circuit components and other motherboard and/or system components to perform desired operations. One type of program is a computer operating system, which, may be executed by CPU on a computer; the operating system enables and facilitates users to access and operate computer information technology and resources. Some resources that may be employed in information technology systems include: input and output mechanisms through which data may pass into and out of a computer; memory storage into which data may be saved; and processors by which information may be processed. These information technology systems may be used to collect data for later retrieval, analysis, and manipulation, which may be facilitated through a database program. These information technology systems provide interfaces that allow users to access and operate various system components.

**[00186]** In one embodiment, the CDDP controller 2801 may be connected to and/or communicate with entities such as, but not limited to: one or more users from user input devices 2811; peripheral devices 2812; an optional cryptographic processor device 2828; and/or a communications network 2813.

**[00187]** Networks are commonly thought to comprise the interconnection and interoperation of clients, servers, and intermediary nodes in a graph topology. It should be noted that the term “server” as used throughout this application refers generally to a

computer, other device, program, or combination thereof that processes and responds to the requests of remote users across a communications network. Servers serve their information to requesting "clients." The term "client" as used herein refers generally to a computer, program, other device, user and/or combination thereof that is capable of processing and making requests and obtaining and processing any responses from servers across a communications network. A computer, other device, program, or combination thereof that facilitates, processes information and requests, and/or furthers the passage of information from a source user to a destination user is commonly referred to as a "node." Networks are generally thought to facilitate the transfer of information from source points to destinations. A node specifically tasked with furthering the passage of information from a source to a destination is commonly called a "router." There are many forms of networks such as Local Area Networks (LANs), Pico networks, Wide Area Networks (WANs), Wireless Networks (WLANs), etc. For example, the Internet is generally accepted as being an interconnection of a multitude of networks whereby remote clients and servers may access and interoperate with one another.

**[00188]** The CDDP controller 2801 may be based on computer systems that may comprise, but are not limited to, components such as: a computer systemization 2802 connected to memory 2829.

## Computer Systemization

**[00189]** A computer systemization 2802 may comprise a clock 2830, central processing unit ("CPU(s)" and/or "processor(s)" (these terms are used interchangeable throughout the disclosure unless noted to the contrary)) 2803, a memory 2829 (e.g., a

read only memory (ROM) 2806, a random access memory (RAM) 2805, etc.), and/or an interface bus 2807, and most frequently, although not necessarily, are all interconnected and/or communicating through a system bus 2804 on one or more (mother)board(s) 2802 having conductive and/or otherwise transportive circuit pathways through which instructions (e.g., binary encoded signals) may travel to effectuate communications, operations, storage, etc. The computer systemization may be connected to a power source 2886; e.g., optionally the power source may be internal. Optionally, a cryptographic processor 2826 and/or transceivers (e.g., ICs) 2874 may be connected to the system bus. In another embodiment, the cryptographic processor and/or transceivers may be connected as either internal and/or external peripheral devices 2812 via the interface bus I/O. In turn, the transceivers may be connected to antenna(s) 2875, thereby effectuating wireless transmission and reception of various communication and/or sensor protocols; for example the antenna(s) may connect to: a Texas Instruments WiLink WL1283 transceiver chip (e.g., providing 802.11n, Bluetooth 3.0, FM, global positioning system (GPS) (thereby allowing CDDP controller to determine its location)); Broadcom BCM4329FKUBG transceiver chip (e.g., providing 802.11n, Bluetooth 2.1 + EDR, FM, etc.); a Broadcom BCM4750IUB8 receiver chip (e.g., GPS); an Infineon Technologies X-Gold 618-PMB9800 (e.g., providing 2G/3G HSDPA/HSUPA communications); and/or the like. The system clock typically has a crystal oscillator and generates a base signal through the computer systemization's circuit pathways. The clock is typically coupled to the system bus and various clock multipliers that will increase or decrease the base operating frequency for other components interconnected in the computer systemization. The clock and various components in a computer systemization drive signals embodying information

throughout the system. Such transmission and reception of instructions embodying information throughout a computer systemization may be commonly referred to as communications. These communicative instructions may further be transmitted, received, and the cause of return and/or reply communications beyond the instant computer systemization to: communications networks, input devices, other computer systemizations, peripheral devices, and/or the like. It should be understood that in alternative embodiments, any of the above components may be connected directly to one another, connected to the CPU, and/or organized in numerous variations employed as exemplified by various computer systems.

**[00190]** The CPU comprises at least one high-speed data processor adequate to execute program components for executing user and/or system-generated requests. Often, the processors themselves will incorporate various specialized processing units, such as, but not limited to: integrated system (bus) controllers, memory management control units, floating point units, and even specialized processing sub-units like graphics processing units, digital signal processing units, and/or the like. Additionally, processors may include internal fast access addressable memory, and be capable of mapping and addressing memory 2829 beyond the processor itself; internal memory may include, but is not limited to: fast registers, various levels of cache memory (e.g., level 1, 2, 3, etc.), RAM, etc. The processor may access this memory through the use of a memory address space that is accessible via instruction address, which the processor can construct and decode allowing it to access a circuit path to a specific memory address space having a memory state. The CPU may be a microprocessor such as: AMD's Athlon, Duron and/or Opteron; ARM's application, embedded and secure processors; IBM and/or Motorola's DragonBall and PowerPC; IBM's and Sony's Cell

processor; Intel's Celeron, Core (2) Duo, Itanium, Pentium, Xeon, and/or XScale; and/or the like processor(s). The CPU interacts with memory through instruction passing through conductive and/or transportive conduits (e.g., (printed) electronic and/or optic circuits) to execute stored instructions (i.e., program code) according to conventional data processing techniques. Such instruction passing facilitates communication within the CDDP controller and beyond through various interfaces. Should processing requirements dictate a greater amount speed and/or capacity, distributed processors (e.g., Distributed CDDP), mainframe, multi-core, parallel, and/or super-computer architectures may similarly be employed.Alternatively, should deployment requirements dictate greater portability, smaller Personal Digital Assistants (PDAs) may be employed.

**[00191]** Depending on the particular implementation, features of the CDDP may be achieved by implementing a microcontroller such as CAST's R8051XC2 microcontroller; Intel's MCS 51 (i.e., 8051 microcontroller); and/or the like. Also, to implement certain features of the CDDP, some feature implementations may rely on embedded components, such as: Application-Specific Integrated Circuit ("ASIC"), Digital Signal Processing ("DSP"), Field Programmable Gate Array ("FPGA"), and/or the like embedded technology. For example, any of the CDDP component collection (distributed or otherwise) and/or features may be implemented via the microprocessor and/or via embedded components; e.g., via ASIC, coprocessor, DSP, FPGA, and/or the like. Alternately, some implementations of the CDDP may be implemented with embedded components that are configured and used to achieve a variety of features or signal processing.

[00192] Depending on the particular implementation, the embedded components may include software solutions, hardware solutions, and/or some combination of both hardware/software solutions. For example, CDDP features discussed herein may be achieved through implementing FPGAs, which are a semiconductor devices containing programmable logic components called "logic blocks", and programmable interconnects, such as the high performance FPGA Virtex series and/or the low cost Spartan series manufactured by Xilinx. Logic blocks and interconnects can be programmed by the customer or designer, after the FPGA is manufactured, to implement any of the CDDP features. A hierarchy of programmable interconnects allow logic blocks to be interconnected as needed by the CDDP system designer/administrator, somewhat like a one-chip programmable breadboard. An FPGA's logic blocks can be programmed to perform the operation of basic logic gates such as AND, and XOR, or more complex combinational operators such as decoders or mathematical operations. In most FPGAs, the logic blocks also include memory elements, which may be circuit flip-flops or more complete blocks of memory. In some circumstances, the CDDP may be developed on regular FPGAs and then migrated into a fixed version that more resembles ASIC implementations. Alternate or coordinating implementations may migrate CDDP controller features to a final ASIC instead of or in addition to FPGAs. Depending on the implementation all of the aforementioned embedded components and microprocessors may be considered the “CPU” and/or “processor” for the CDDP.

## Power Source

[00193] The power source 2886 may be of any standard form for powering small electronic circuit board devices such as the following power cells: alkaline, lithium hydride, lithium ion, lithium polymer, nickel cadmium, solar cells, and/or the like. Other types of AC or DC power sources may be used as well. In the case of solar cells, in one embodiment, the case provides an aperture through which the solar cell may capture photonic energy. The power cell 2886 is connected to at least one of the interconnected subsequent components of the CDDP thereby providing an electric current to all subsequent components. In one example, the power source 2886 is connected to the system bus component 2804. In an alternative embodiment, an outside power source 2886 is provided through a connection across the I/O 2808 interface. For example, a USB and/or IEEE 1394 connection carries both data and power across the connection and is therefore a suitable source of power.

## Interface Adapters

[00194] Interface bus(ses) 2807 may accept, connect, and/or communicate to a number of interface adapters, conventionally although not necessarily in the form of adapter cards, such as but not limited to: input output interfaces (I/O) 2808, storage interfaces 2809, network interfaces 2810, and/or the like. Optionally, cryptographic processor interfaces 2827 similarly may be connected to the interface bus. The interface bus provides for the communications of interface adapters with one another as well as with other components of the computer systemization. Interface adapters are adapted for a compatible interface bus. Interface adapters conventionally connect to the interface bus via a slot architecture. Conventional slot architectures may be employed,

such as, but not limited to: Accelerated Graphics Port (AGP), Card Bus, (Extended) Industry Standard Architecture ((E)ISA), Micro Channel Architecture (MCA), NuBus, Peripheral Component Interconnect (Extended) (PCI(X)), PCI Express, Personal Computer Memory Card International Association (PCMCIA), and/or the like.

**[00195]** Storage interfaces 2809 may accept, communicate, and/or connect to a number of storage devices such as, but not limited to: storage devices 2814, removable disc devices, and/or the like. Storage interfaces may employ connection protocols such as, but not limited to: (Ultra) (Serial) Advanced Technology Attachment (Packet Interface) ((Ultra) (Serial) ATA(PI)), (Enhanced) Integrated Drive Electronics ((E)IDE), Institute of Electrical and Electronics Engineers (IEEE) 1394, fiber channel, Small Computer Systems Interface (SCSI), Universal Serial Bus (USB), and/or the like.

**[00196]** Network interfaces 2810 may accept, communicate, and/or connect to a communications network 2813. Through a communications network 2813, the CDDP controller is accessible through remote clients 2833b (e.g., computers with web browsers) by users 2833a. Network interfaces may employ connection protocols such as, but not limited to: direct connect, Ethernet (thick, thin, twisted pair 10/100/1000 Base T, and/or the like), Token Ring, wireless connection such as IEEE 802.11a-x, and/or the like. Should processing requirements dictate a greater amount speed and/or capacity, distributed network controllers (e.g., Distributed CDDP), architectures may similarly be employed to pool, load balance, and/or otherwise increase the communicative bandwidth required by the CDDP controller. A communications network may be any one and/or the combination of the following: a direct interconnection; the Internet; a Local Area Network (LAN); a Metropolitan Area Network (MAN); an Operating

Missions as Nodes on the Internet (OMNI); a secured custom connection; a Wide Area Network (WAN); a wireless network (e.g., employing protocols such as, but not limited to a Wireless Application Protocol (WAP), I-mode, and/or the like); and/or the like. A network interface may be regarded as a specialized form of an input output interface. Further, multiple network interfaces 2810 may be used to engage with various communications network types 2813. For example, multiple network interfaces may be employed to allow for the communication over broadcast, multicast, and/or unicast networks.

**[00197]** Input Output interfaces (I/O) 2808 may accept, communicate, and/or connect to user input devices 2811, peripheral devices 2812, cryptographic processor devices 2828, and/or the like. I/O may employ connection protocols such as, but not limited to: audio: analog, digital, monaural, RCA, stereo, and/or the like; data: Apple Desktop Bus (ADB), IEEE 1394a-b, serial, universal serial bus (USB); infrared; joystick; keyboard; midi; optical; PC AT; PS/2; parallel; radio; video interface: Apple Desktop Connector (ADC), BNC, coaxial, component, composite, digital, Digital Visual Interface (DVI), high-definition multimedia interface (HDMI), RCA, RF antennae, S-Video, VGA, and/or the like; wireless transceivers: 802.11a/b/g/n/x; Bluetooth; cellular (e.g., code division multiple access (CDMA), high speed packet access (HSPA(+)), high-speed downlink packet access (HSDPA), global system for mobile communications (GSM), long term evolution (LTE), WiMax, etc.); and/or the like. One typical output device may include a video display, which typically comprises a Cathode Ray Tube (CRT) or Liquid Crystal Display (LCD) based monitor with an interface (e.g., DVI circuitry and cable) that accepts signals from a video interface, may be used. The video interface composites information generated by a computer systemization and generates video signals based

on the composited information in a video memory frame. Another output device is a television set, which accepts signals from a video interface. Typically, the video interface provides the composited video information through a video connection interface that accepts a video display interface (e.g., an RCA composite video connector accepting an RCA composite video cable; a DVI connector accepting a DVI display cable, etc.).

**[00198]** User input devices 2811 often are a type of peripheral device 512 (see below) and may include: card readers, dongles, finger print readers, gloves, graphics tablets, joysticks, keyboards, microphones, mouse (mice), remote controls, retina readers, touch screens (e.g., capacitive, resistive, etc.), trackballs, trackpads, sensors (e.g., accelerometers, ambient light, GPS, gyroscopes, proximity, etc.), styluses, and/or the like.

**[00199]** Peripheral devices 2812 may be connected and/or communicate to I/O and/or other facilities of the like such as network interfaces, storage interfaces, directly to the interface bus, system bus, the CPU, and/or the like. Peripheral devices may be external, internal and/or part of the CDDP controller. Peripheral devices may include: antenna, audio devices (e.g., line-in, line-out, microphone input, speakers, etc.), cameras (e.g., still, video, webcam, etc.), dongles (e.g., for copy protection, ensuring secure transactions with a digital signature, and/or the like), external processors (for added capabilities; e.g., crypto devices 528), force-feedback devices (e.g., vibrating motors), network interfaces, printers, scanners, storage devices, transceivers (e.g., cellular, GPS, etc.), video devices (e.g., goggles, monitors, etc.), video sources, visors, and/or the like. Peripheral devices often include types of input devices (e.g., cameras).

[00200] It should be noted that although user input devices and peripheral devices may be employed, the CDDP controller may be embodied as an embedded, dedicated, and/or monitor-less (i.e., headless) device, wherein access would be provided over a network interface connection.

[00201] Cryptographic units such as, but not limited to, microcontrollers, processors 2826, interfaces 2827, and/or devices 2828 may be attached, and/or communicate with the CDDP controller. A MC68HC16 microcontroller, manufactured by Motorola Inc., may be used for and/or within cryptographic units. The MC68HC16 microcontroller utilizes a 16-bit multiply-and-accumulate instruction in the 16 MHz configuration and requires less than one second to perform a 512-bit RSA private key operation. Cryptographic units support the authentication of communications from interacting agents, as well as allowing for anonymous transactions. Cryptographic units may also be configured as part of the CPU. Equivalent microcontrollers and/or processors may also be used. Other commercially available specialized cryptographic processors include: Broadcom's CryptoNetX and other Security Processors; nCipher's nShield; SafeNet's Luna PCI (e.g., 7100) series; Semaphore Communications' 40 MHz Roadrunner 184; Sun's Cryptographic Accelerators (e.g., Accelerator 6000 PCIe Board, Accelerator 500 Daughtercard); Via Nano Processor (e.g., L2100, L2200, U2400) line, which is capable of performing 500+ MB/s of cryptographic instructions; VLSI Technology's 33 MHz 6868; and/or the like.

## Memory

[00202] Generally, any mechanization and/or embodiment allowing a processor to affect the storage and/or retrieval of information is regarded as memory 2829.

However, memory is a fungible technology and resource, thus, any number of memory embodiments may be employed in lieu of or in concert with one another. It is to be understood that the CDDP controller and/or a computer systemization may employ various forms of memory 2829. For example, a computer systemization may be configured wherein the operation of on-chip CPU memory (e.g., registers), RAM, ROM, and any other storage devices are provided by a paper punch tape or paper punch card mechanism; however, such an embodiment would result in an extremely slow rate of operation. In a typical configuration, memory 2829 will include ROM 2806, RAM 2805, and a storage device 2814. A storage device 2814 may be any conventional computer system storage. Storage devices may include a drum; a (fixed and/or removable) magnetic disk drive; a magneto-optical drive; an optical drive (i.e., Blueray, CD ROM/RAM/Recordable (R)/ReWritable (RW), DVD R/RW, HD DVD R/RW etc.); an array of devices (e.g., Redundant Array of Independent Disks (RAID)); solid state memory devices (USB memory, solid state drives (SSD), etc.); other processor-readable storage mediums; and/or other devices of the like. Thus, a computer systemization generally requires and makes use of memory.

## Component Collection

**[00203]** The memory 2829 may contain a collection of program and/or database components and/or data such as, but not limited to: operating system component(s) 2815 (operating system); information server component(s) 2816 (information server); user interface component(s) 2817 (user interface); Web browser component(s) 2818 (Web browser); database(s) 2819; mail server component(s) 2821; mail client component(s) 2822; cryptographic server component(s) 2820 (cryptographic server);

the CDDP component(s) 2835; and/or the like (i.e., collectively a component collection). These components may be stored and accessed from the storage devices and/or from storage devices accessible through an interface bus. Although non-conventional program components such as those in the component collection, typically, are stored in a local storage device 2814, they may also be loaded and/or stored in memory such as: peripheral devices, RAM, remote storage facilities through a communications network, ROM, various forms of memory, and/or the like.

## Operating System

**[00204]** The operating system component 2815 is an executable program component facilitating the operation of the CDDP controller. Typically, the operating system facilitates access of I/O, network interfaces, peripheral devices, storage devices, and/or the like. The operating system may be a highly fault tolerant, scalable, and secure system such as: Apple Macintosh OS X (Server); AT&T Plan 9; Be OS; Unix and Unix-like system distributions (such as AT&T's UNIX; Berkley Software Distribution (BSD) variations such as FreeBSD, NetBSD, OpenBSD, and/or the like; Linux distributions such as Red Hat, Ubuntu, and/or the like); and/or the like operating systems. However, more limited and/or less secure operating systems also may be employed such as Apple Macintosh OS, IBM OS/2, Microsoft DOS, Microsoft Windows 2000/2003/3.1/95/98/CE/Millenium/NT/Vista/XP (Server), Palm OS, and/or the like. An operating system may communicate to and/or with other components in a component collection, including itself, and/or the like. Most frequently, the operating system communicates with other program components, user interfaces, and/or the like. For example, the operating system may contain, communicate, generate, obtain, and/or

provide program component, system, user, and/or data communications, requests, and/or responses. The operating system, once executed by the CPU, may enable the interaction with communications networks, data, I/O, peripheral devices, program components, memory, user input devices, and/or the like. The operating system may provide communications protocols that allow the CDDP controller to communicate with other entities through a communications network 2813. Various communication protocols may be used by the CDDP controller as a subcarrier transport mechanism for interaction, such as, but not limited to: multicast, TCP/IP, UDP, unicast, and/or the like.

## Information Server

**[00205]** An information server component 2816 is a stored program component that is executed by a CPU. The information server may be a conventional Internet information server such as, but not limited to Apache Software Foundation's Apache, Microsoft's Internet Information Server, and/or the like. The information server may allow for the execution of program components through facilities such as Active Server Page (ASP), ActiveX, (ANSI) (Objective-) C (++), C# and/or .NET, Common Gateway Interface (CGI) scripts, dynamic (D) hypertext markup language (HTML), FLASH, Java, JavaScript, Practical Extraction Report Language (PERL), Hypertext Pre-Processor (PHP), pipes, Python, wireless application protocol (WAP), WebObjects, and/or the like. The information server may support secure communications protocols such as, but not limited to, File Transfer Protocol (FTP); HyperText Transfer Protocol (HTTP); Secure Hypertext Transfer Protocol (HTTPS), Secure Socket Layer (SSL), messaging protocols (e.g., America Online (AOL) Instant Messenger (AIM), Application Exchange (APEX),

ICQ, Internet Relay Chat (IRC), Microsoft Network (MSN) Messenger Service, Presence and Instant Messaging Protocol (PRIM), Internet Engineering Task Force's (IETF's) Session Initiation Protocol (SIP), SIP for Instant Messaging and Presence Leveraging Extensions (SIMPLE), open XML-based Extensible Messaging and Presence Protocol (XMPP) (i.e., Jabber or Open Mobile Alliance's (OMA's) Instant Messaging and Presence Service (IMPS)), Yahoo! Instant Messenger Service, and/or the like. The information server provides results in the form of Web pages to Web browsers, and allows for the manipulated generation of the Web pages through interaction with other program components. After a Domain Name System (DNS) resolution portion of an HTTP request is resolved to a particular information server, the information server resolves requests for information at specified locations on the CDDP controller based on the remainder of the HTTP request. For example, a request such as http://123.124.125.126/myInformation.html might have the IP portion of the request "123.124.125.126" resolved by a DNS server to an information server at that IP address; that information server might in turn further parse the http request for the "/myInformation.html" portion of the request and resolve it to a location in memory containing the information "myInformation.html." Additionally, other information serving protocols may be employed across various ports, e.g., FTP communications across port 21, and/or the like. An information server may communicate to and/or with other components in a component collection, including itself, and/or facilities of the like. Most frequently, the information server communicates with the CDDP database 2819, operating systems, other program components, user interfaces, Web browsers, and/or the like.

[00206] Access to the CDDP database may be achieved through a number of database bridge mechanisms such as through scripting languages as enumerated below (e.g., CGI) and through inter-application communication channels as enumerated below (e.g., CORBA, WebObjects, etc.). Any data requests through a Web browser are parsed through the bridge mechanism into appropriate grammars as required by the CDDP. In one embodiment, the information server would provide a Web form accessible by a Web browser. Entries made into supplied fields in the Web form are tagged as having been entered into the particular fields, and parsed as such. The entered terms are then passed along with the field tags, which act to instruct the parser to generate queries directed to appropriate tables and/or fields. In one embodiment, the parser may generate queries in standard SQL by instantiating a search string with the proper join/select commands based on the tagged text entries, wherein the resulting command is provided over the bridge mechanism to the CDDP as a query. Upon generating query results from the query, the results are passed over the bridge mechanism, and may be parsed for formatting and generation of a new results Web page by the bridge mechanism. Such a new results Web page is then provided to the information server, which may supply it to the requesting Web browser.

[00207] Also, an information server may contain, communicate, generate, obtain, and/or provide program component, system, user, and/or data communications, requests, and/or responses.

## User Interface

[00208] Computer interfaces in some respects are similar to automobile operation interfaces. Automobile operation interface elements such as steering wheels, gearshifts,

and speedometers facilitate the access, operation, and display of automobile resources, and status. Computer interaction interface elements such as check boxes, cursors, menus, scrollers, and windows (collectively and commonly referred to as widgets) similarly facilitate the access, capabilities, operation, and display of data and computer hardware and operating system resources, and status. Operation interfaces are commonly called user interfaces. Graphical user interfaces (GUIs) such as the Apple Macintosh Operating System's Aqua, IBM's OS/2, Microsoft's Windows 2000/2003/3.1/95/98/CE/Millenium/NT/XP/Vista/7 (i.e., Aero), Unix's X-Windows (e.g., which may include additional Unix graphic interface libraries and layers such as K Desktop Environment (KDE), mythTV and GNU Network Object Model Environment (GNOME)), web interface libraries (e.g., ActiveX, AJAX, (D)HTML, FLASH, Java, JavaScript, etc. interface libraries such as, but not limited to, Dojo, jQuery(UI), MooTools, Prototype, script.aculo.us, SWFObject, Yahoo! User Interface, any of which may be used and) provide a baseline and means of accessing and displaying information graphically to users.

**[00209]** A user interface component 2817 is a stored program component that is executed by a CPU. The user interface may be a conventional graphic user interface as provided by, with, and/or atop operating systems and/or operating environments such as already discussed. The user interface may allow for the display, execution, interaction, manipulation, and/or operation of program components and/or system facilities through textual and/or graphical facilities. The user interface provides a facility through which users may affect, interact, and/or operate a computer system. A user interface may communicate to and/or with other components in a component collection, including itself, and/or facilities of the like. Most frequently, the user

interface communicates with operating systems, other program components, and/or the like. The user interface may contain, communicate, generate, obtain, and/or provide program component, system, user, and/or data communications, requests, and/or responses.

## Web Browser

**[00210]** A Web browser component 2818 is a stored program component that is executed by a CPU. The Web browser may be a conventional hypertext viewing application such as Microsoft Internet Explorer or Netscape Navigator. Secure Web browsing may be supplied with 128bit (or greater) encryption by way of HTTPS, SSL, and/or the like. Web browsers allowing for the execution of program components through facilities such as ActiveX, AJAX, (D)HTML, FLASH, Java, JavaScript, web browser plug-in APIs (e.g., FireFox, Safari Plug-in, and/or the like APIs), and/or the like. Web browsers and like information access tools may be integrated into PDAs, cellular telephones, and/or other mobile devices. A Web browser may communicate to and/or with other components in a component collection, including itself, and/or facilities of the like. Most frequently, the Web browser communicates with information servers, operating systems, integrated program components (e.g., plug-ins), and/or the like; e.g., it may contain, communicate, generate, obtain, and/or provide program component, system, user, and/or data communications, requests, and/or responses. Also, in place of a Web browser and information server, a combined application may be developed to perform similar operations of both. The combined application would similarly affect the obtaining and the provision of information to users, user agents,

and/or the like from the CDDP enabled nodes. The combined application may be nugatory on systems employing standard Web browsers.

## Mail Server

**[00211]** A mail server component 2821 is a stored program component that is executed by a CPU 2803. The mail server may be a conventional Internet mail server such as, but not limited to sendmail, Microsoft Exchange, and/or the like. The mail server may allow for the execution of program components through facilities such as ASP, ActiveX, (ANSI) (Objective-) C (++), C# and/or .NET, CGI scripts, Java, JavaScript, PERL, PHP, pipes, Python, WebObjects, and/or the like. The mail server may support communications protocols such as, but not limited to: Internet message access protocol (IMAP), Messaging Application Programming Interface (MAPI)/Microsoft Exchange, post office protocol (POP3), simple mail transfer protocol (SMTP), and/or the like. The mail server can route, forward, and process incoming and outgoing mail messages that have been sent, relayed and/or otherwise traversing through and/or to the CDDP.

**[00212]** Access to the CDDP mail may be achieved through a number of APIs offered by the individual Web server components and/or the operating system.

**[00213]** Also, a mail server may contain, communicate, generate, obtain, and/or provide program component, system, user, and/or data communications, requests, information, and/or responses.

## Mail Client

[00214] A mail client component 2822 is a stored program component that is executed by a CPU 2803. The mail client may be a conventional mail viewing application such as Apple Mail, Microsoft Entourage, Microsoft Outlook, Microsoft Outlook Express, Mozilla, Thunderbird, and/or the like. Mail clients may support a number of transfer protocols, such as: IMAP, Microsoft Exchange, POP3, SMTP, and/or the like. A mail client may communicate to and/or with other components in a component collection, including itself, and/or facilities of the like. Most frequently, the mail client communicates with mail servers, operating systems, other mail clients, and/or the like; e.g., it may contain, communicate, generate, obtain, and/or provide program component, system, user, and/or data communications, requests, information, and/or responses. Generally, the mail client provides a facility to compose and transmit electronic mail messages.

## Cryptographic Server

[00215] A cryptographic server component 2820 is a stored program component that is executed by a CPU 2803, cryptographic processor 2826, cryptographic processor interface 2827, cryptographic processor device 2828, and/or the like. Cryptographic processor interfaces will allow for expedition of encryption and/or decryption requests by the cryptographic component; however, the cryptographic component, alternatively, may run on a conventional CPU. The cryptographic component allows for the encryption and/or decryption of provided data. The cryptographic component allows for both symmetric and asymmetric (e.g., Pretty Good Protection (PGP)) encryption and/or decryption. The cryptographic component may employ cryptographic techniques such

as, but not limited to: digital certificates (e.g., X.509 authentication framework), digital signatures, dual signatures, enveloping, password access protection, public key management, and/or the like. The cryptographic component will facilitate numerous (encryption and/or decryption) security protocols such as, but not limited to: checksum, Data Encryption Standard (DES), Elliptical Curve Encryption (ECC), International Data Encryption Algorithm (IDEA), Message Digest 5 (MD5, which is a one way hash operation), passwords, Rivest Cipher (RC5), Rijndael, RSA (which is an Internet encryption and authentication system that uses an algorithm developed in 1977 by Ron Rivest, Adi Shamir, and Leonard Adleman), Secure Hash Algorithm (SHA), Secure Socket Layer (SSL), Secure Hypertext Transfer Protocol (HTTPS), and/or the like. Employing such encryption security protocols, the CDDP may encrypt all incoming and/or outgoing communications and may serve as node within a virtual private network (VPN) with a wider communications network. The cryptographic component facilitates the process of "security authorization" whereby access to a resource is inhibited by a security protocol wherein the cryptographic component effects authorized access to the secured resource. In addition, the cryptographic component may provide unique identifiers of content, e.g., employing and MD5 hash to obtain a unique signature for an digital audio file. A cryptographic component may communicate to and/or with other components in a component collection, including itself, and/or facilities of the like. The cryptographic component supports encryption schemes allowing for the secure transmission of information across a communications network to enable the CDDP component to engage in secure transactions if so desired. The cryptographic component facilitates the secure accessing of resources on the CDDP and facilitates the access of secured resources on remote systems; i.e., it may act as a client

and/or server of secured resources. Most frequently, the cryptographic component communicates with information servers, operating systems, other program components, and/or the like. The cryptographic component may contain, communicate, generate, obtain, and/or provide program component, system, user, and/or data communications, requests, and/or responses.

## The CDDP Database

**[00216]** The CDDP database component 2819 may be embodied in a database and its stored data. The database is a stored program component, which is executed by the CPU; the stored program component portion configuring the CPU to process the stored data. The database may be a conventional, fault tolerant, relational, scalable, secure database such as Oracle or Sybase. Relational databases are an extension of a flat file. Relational databases consist of a series of related tables. The tables are interconnected via a key field. Use of the key field allows the combination of the tables by indexing against the key field; i.e., the key fields act as dimensional pivot points for combining information from various tables. Relationships generally identify links maintained between tables by matching primary keys. Primary keys represent fields that uniquely identify the rows of a table in a relational database. More precisely, they uniquely identify rows of a table on the “one” side of a one-to-many relationship.

**[00217]** Alternatively, the CDDP database may be implemented using various standard data-structures, such as an array, hash, (linked) list, struct, structured text file (e.g., XML), table, and/or the like. Such data-structures may be stored in memory and/or in (structured) files. In another alternative, an object-oriented database may be used, such as Frontier, ObjectStore, Poet, Zope, and/or the like. Object databases can

include a number of object collections that are grouped and/or linked together by common attributes; they may be related to other object collections by some common attributes. Object-oriented databases perform similarly to relational databases with the exception that objects are not just pieces of data but may have other types of capabilities encapsulated within a given object. If the CDDP database is implemented as a data-structure, the use of the CDDP database 2819 may be integrated into another component such as the CDDP component 2835. Also, the database may be implemented as a mix of data structures, objects, and relational structures. Databases may be consolidated and/or distributed in countless variations through standard data processing techniques. Portions of databases, e.g., tables, may be exported and/or imported and thus decentralized and/or integrated.

**[00218]** In one embodiment, the database component 2819 includes several tables 2819a-k. A User Accounts table 2219a may include fields such as, but not limited to: user_ID, user_password, user_device, user_IP, user_entity, user_media, user_search, user_socialConnections, user_following, user_followed, and/or the like. The User table may support and/or track multiple entity accounts on a CDDP. A metadata table 2219b may include fields such as, but not limited to: track_ID, media_type, media_name, media_size, media_genre, media_album, media_artist, media_user, media_length, media_ranking, media_year, and/or the like. A search table 2219c may include fields such as, but not limited to: search_ID, search_userID, search_content, search_time, search_socialConnection, search_result, and/or the like. A social table 2219d may include fields such as, but not limited to: social_ID, social_name, social_connection, social_searchHistory, social_medialData, and/or the like. A media table 2219e may include fields such as, but not limited to: user_ID, track_ID, media_type, and/or the

like. A reporting table 2219f may include fields such as, but not limited to: track_ID, track_playcount, track_royalty, track_added_date, statement_ID, and/or the like. A playlist table 2219g may include fields such as, but not limited to: user_ID, track_ID, playlist_pubdate, playlist_share, and/or the like. The core may include additional databases and/or tables. A log table 2219h may include fields such as, but not limited to: log_ID, log_user_ID, log_deviceID, log_date, log_type, and/or the like. A system model layout table 2219i may include fields such as, but not limited to: layout_ID, bandwidth, and/or the like. A service table 2219j may include fields such as, but not limited to: notification_rule, threshold, log source, resource requirements, priority, and/or the like. A Client Account table 2219k may include fields such as, but not limited to: client_ID, client_account, client_name, client_password, client_permissions, and/or the like.

**[00219]** In one embodiment, the CDDP database may interact with other database systems. For example, employing a distributed database system, queries and data access by search CDDP component may treat the combination of the CDDP database, an integrated data security layer database as a single database entity.

**[00220]** In one embodiment, user programs may contain various user interface primitives, which may serve to update the CDDP. Also, various accounts may require custom database tables depending upon the environments and the types of clients the CDDP may need to serve. It should be noted that any unique fields may be designated as a key field throughout. In an alternative embodiment, these tables have been decentralized into their own databases and their respective database controllers (i.e., individual database controllers for each of the above tables). Employing standard data

processing techniques, one may further distribute the databases over several computer systemizations and/or storage devices. Similarly, configurations of the decentralized database controllers may be varied by consolidating and/or distributing the various database components 2819a-k. The CDDP may be configured to keep track of various settings, inputs, and parameters via database controllers.

**[00221]** The CDDP database may communicate to and/or with other components in a component collection, including itself, and/or facilities of the like. Most frequently, the CDDP database communicates with the CDDP component, other program components, and/or the like. The database may contain, retain, and provide information regarding other nodes and data.

## The CDDPs

**[00222]** The CDDP component 2835 is a stored program component that is executed by a CPU. In one embodiment, the CDDP component incorporates any and/or all combinations of the aspects of the CDDP that was discussed in the previous figures. As such, the CDDP affects accessing, obtaining and the provision of information, services, transactions, and/or the like across various communications networks.

**[00223]** The CDDP may transform inputs via CDDP components into outputs and/or the like and use of the CDDP. In one embodiment, the CDDP component 2235 takes inputs (e.g., content seed, play count data, event data, triggers, and/or the like) etc., and transforms the inputs via various components (e.g., discovery component, play count reporting component, license verification component, and/or the like), into outputs (e.g., search results, royalties, license verification, and/or the like).

[00224] The CDDP component enabling access of information between nodes may be developed by employing standard development tools and languages such as, but not limited to: Apache components, Assembly, ActiveX, binary executables, (ANSI) (Objective-) C (++), C# and/or .NET, database adapters, CGI scripts, Java, JavaScript, mapping tools, procedural and object oriented development tools, PERL, PHP, Python, shell scripts, SQL commands, web application server extensions, web development environments and libraries (e.g., Microsoft's ActiveX; Adobe AIR, FLEX & FLASH; AJAX; (D)HTML; Dojo, Java; JavaScript; jQuery(UI); MooTools; Prototype; script.aculo.us; Simple Object Access Protocol (SOAP); SWFObject; Yahoo! User Interface; and/or the like), WebObjects, and/or the like. In one embodiment, the CDDP server employs a cryptographic server to encrypt and decrypt communications. The CDDP component may communicate to and/or with other components in a component collection, including itself, and/or facilities of the like. Most frequently, the CDDP component communicates with the CDDP database, operating systems, other program components, and/or the like. The CDDP may contain, communicate, generate, obtain, and/or provide program component, system, user, and/or data communications, requests, and/or responses.

## Distributed CDDPs

[00225] The structure and/or operation of any of the CDDP node controller components may be combined, consolidated, and/or distributed in any number of ways to facilitate development and/or deployment. Similarly, the component collection may be combined in any number of ways to facilitate deployment and/or development. To

accomplish this, one may integrate the components into a common code base or in a facility that can dynamically load the components on demand in an integrated fashion.

**[00226]** The component collection may be consolidated and/or distributed in countless variations through standard data processing and/or development techniques. Multiple instances of any one of the program components in the program component collection may be instantiated on a single node, and/or across numerous nodes to improve performance through load-balancing and/or data-processing techniques. Furthermore, single instances may also be distributed across multiple controllers and/or storage devices; e.g., databases. All program component instances and controllers working in concert may do so through standard data processing communication techniques.

**[00227]** The configuration of the CDDP controller will depend on the context of system deployment. Factors such as, but not limited to, the budget, capacity, location, and/or use of the underlying hardware resources may affect deployment requirements and configuration. Regardless of if the configuration results in more consolidated and/or integrated program components, results in a more distributed series of program components, and/or results in some combination between a consolidated and distributed configuration, data may be communicated, obtained, and/or provided. Instances of components consolidated into a common code base from the program component collection may communicate, obtain, and/or provide data. This may be accomplished through intra-application data processing communication techniques such as, but not limited to: data referencing (e.g., pointers), internal messaging, object

instance variable communication, shared memory space, variable passing, and/or the like.

**[00228]** If component collection components are discrete, separate, and/or external to one another, then communicating, obtaining, and/or providing data with and/or to other component components may be accomplished through inter-application data processing communication techniques such as, but not limited to: Application Program Interfaces (API) information passage; (distributed) Component Object Model ((D)COM), (Distributed) Object Linking and Embedding ((D)OLE), and/or the like), Common Object Request Broker Architecture (CORBA), Jini local and remote application program interfaces, JavaScript Object Notation (JSON), Remote Method Invocation (RMI), SOAP, process pipes, shared files, and/or the like. Messages sent between discrete component components for inter-application communication or within memory spaces of a singular component for intra-application communication may be facilitated through the creation and parsing of a grammar. A grammar may be developed by using development tools such as lex, yacc, XML, and/or the like, which allow for grammar generation and parsing capabilities, which in turn may form the basis of communication messages within and between components.

**[00229]** For example, a grammar may be arranged to recognize the tokens of an HTTP post command, e.g.:

```
w3c -post http://... Value1
```

**[00230]** where Value1 is discerned as being a parameter because “http://” is part of the grammar syntax, and what follows is considered part of the post value. Similarly, with such a grammar, a variable “Value1” may be inserted into an “http://” post

command and then sent. The grammar syntax itself may be presented as structured data that is interpreted and/or otherwise used to generate the parsing mechanism (e.g., a syntax description text file as processed by lex, yacc, etc.). Also, once the parsing mechanism is generated and/or instantiated, it itself may process and/or parse structured data such as, but not limited to: character (e.g., tab) delineated text, HTML, structured text streams, XML, and/or the like structured data. In another embodiment, inter-application data processing protocols themselves may have integrated and/or readily available parsers (e.g., JSON, SOAP, and/or like parsers) that may be employed to parse (e.g., communications) data. Further, the parsing grammar may be used beyond message parsing, but may also be used to parse: databases, data collections, data stores, structured data, and/or the like. Again, the desired configuration will depend upon the context, environment, and requirements of system deployment.

**[00231]** For example, in some implementations, the CDDP controller may be executing a PHP script implementing a Secure Sockets Layer ("SSL") socket server via the information sherver, which listens to incoming communications on a server port to which a client may send data, e.g., data encoded in JSON format. Upon identifying an incoming communication, the PHP script may read the incoming message from the client device, parse the received JSON-encoded text data to extract information from the JSON-encoded text data into PHP script variables, and store the data (e.g., client identifying information, etc.) and/or extracted information in a relational database accessible using the Structured Query Language ("SQL"). An exemplary listing, written substantially in the form of PHP/SQL commands, to accept JSON-encoded input data from a client device via a SSL connection, parse the data to extract variables, and store the data to a database, is provided below:

```
<?PHP
header('Content-Type: text/plain');

// set ip address and port to listen to for incoming data
$address = '192.168.0.100';
$port = 255;

// create a server-side SSL socket, listen for/accept incoming communication
$sock = socket_create(AF_INET, SOCK_STREAM, 0);
socket_bind($sock, $address, $port) or die('Could not bind to address');
socket_listen($sock);
$client = socket_accept($sock);

// read input data from client device in 1024 byte blocks until end of message
do {
          $input = "";
          $input = socket_read($client, 1024);
          $data .= $input;
} while($input != "");

// parse data to extract variables
$obj = json_decode($data, true);

// store input data in a database
mysql_connect("201.408.185.132",$DBserver,$password); // access database server
mysql_select("CLIENT_DB.SQL"); // select database to append
mysql_query("INSERT INTO UserTable (transmission)
VALUES ($data)"); // add data to UserTable table in  a CLIENT database
mysql_close("CLIENT_DB.SQL"); // close connection to database
?>
```

**[00232]** Also, the following resources may be used to provide example embodiments regarding SOAP parser implementation:

```
http://www.xav.com/perl/site/lib/SOAP/Parser.html
http://publib.boulder.ibm.com/infocenter/tivihelp/v2r1/index.jsp?topic=/com.ibm
.IBMDI.doc/referenceguide295.htm
```

**[00233]** and other parser implementations:

```
http://publib.boulder.ibm.com/infocenter/tivihelp/v2r1/index.jsp?topic=/com.ibm
.IBMDI.doc/referenceguide259.htm
```

**[00234]** all of which are hereby expressly incorporated by reference.

**[00235]** In order to address various issues and advance the art, the entirety of this application for CONTENT DISCOVERY AND DELIVERY PLATFORM APPARATUSES, METHODS AND SYSTEMS (including the Cover Page, Title, Headings, Field, Background, Summary, Brief Description of the Drawings, Detailed Description, Claims,

Abstract, FIGUREs, Appendices, and otherwise) shows, by way of illustration, various embodiments in which the claimed innovations may be practiced. The advantages and features of the application are of a representative sample of embodiments only, and are not exhaustive and/or exclusive. They are presented only to assist in understanding and teach the claimed principles. It should be understood that they are not representative of all claimed innovations. As such, certain aspects of the disclosure have not been discussed herein. That alternate embodiments may not have been presented for a specific portion of the innovations or that further undescribed alternate embodiments may be available for a portion is not to be considered a disclaimer of those alternate embodiments. It will be appreciated that many of those undescribed embodiments incorporate the same principles of the innovations and others are equivalent. Thus, it is to be understood that other embodiments may be utilized and functional, logical, operational, organizational, structural and/or topological modifications may be made without departing from the scope and/or spirit of the disclosure. As such, all examples and/or embodiments are deemed to be non-limiting throughout this disclosure. Also, no inference should be drawn regarding those embodiments discussed herein relative to those not discussed herein other than it is as such for purposes of reducing space and repetition. For instance, it is to be understood that the logical and/or topological structure of any combination of any program components (a component collection), other components and/or any present feature sets as described in the figures and/or throughout are not limited to a fixed operating order and/or arrangement, but rather, any disclosed order is exemplary and all equivalents, regardless of order, are contemplated by the disclosure. Furthermore, it is to be understood that such features are not limited to serial execution, but rather, any number of threads, processes,

services, servers, and/or the like that may execute asynchronously, concurrently, in parallel, simultaneously, synchronously, and/or the like are contemplated by the disclosure. As such, some of these features may be mutually contradictory, in that they cannot be simultaneously present in a single embodiment. Similarly, some features are applicable to one aspect of the innovations, and inapplicable to others. In addition, the disclosure includes other innovations not presently claimed. Applicant reserves all rights in those presently unclaimed innovations including the right to claim such innovations, file additional applications, continuations, continuations in part, divisions, and/or the like thereof. As such, it should be understood that advantages, embodiments, examples, functional, features, logical, operational, organizational, structural, topological, and/or other aspects of the disclosure are not to be considered limitations on the disclosure as defined by the claims or limitations on equivalents to the claims. It is to be understood that, depending on the particular needs and/or characteristics of a CDDP individual and/or enterprise user, database configuration and/or relational model, data type, data transmission and/or network framework, syntax structure, and/or the like, various embodiments of the CDDP, may be implemented that enable a great deal of flexibility and customization. For example, aspects of the CDDP may be adapted for p2p music discovery and delivery platform. While various embodiments and discussions of the CDDP have been directed to multimedia applications, however, it is to be understood that the embodiments described herein may be readily configured and/or customized for a wide variety of other applications and/or implementations.

# CLAIMS

What is claimed is:

1. A non-local content caching processor-implemented method, comprising:

obtaining a universally resolvable list of content items on a local client;

identifying a non-local item from the universally resolvable list of content items that is absent on the local client;

generating a local cache request for the identified non-local item having an associated universally resolvable content identifier;

transmitting the generated local cache request to a universally resolvable content server;

receiving, in response to the transmitted request, a universally resolvable content item corresponding to the local cache request; and

marking the requested item as temporary and locally available upon receiving the content item.

2. The method of claim 1, wherein the server queries a universally resolvable content database to retrieve the universally resolvable content item.

3. The method of claim 1, wherein identifying the non-local item includes conducting a search for the non-local item on the local client.

4. The method of claim 1, wherein the locally available content item is engageable as it is partially downloaded.

5. The method of claim 1, wherein the locally available content item is engageable as it is fully downloaded.

6. The method of claim 1, wherein the universally resolvable content identifier is a track identifier (ID).

7. The method of claim 6, wherein identifying the non-local item includes comparing track identifiers associated local items in the local client to the obtained list of track identifiers.

8. The method of claim 1, wherein the local cache request includes at least a universally resolvable content service user identifier and a universally resolvable content identifier associated with the identified non-local item.

9. The method of claim 1, further comprising:

storing the received universally resolvable content item corresponding to the local cache request in a cache in the local client.

10. The method of claim 1, further comprising:

deleting one or more content items in the cache local client prior to the storing.

11. The method of claim 10, wherein the content items are deleted based on last hit time.

12. The method of claim 10, wherein the content items are deleted based on content item size.

13. The method of claim 10, wherein the content items are deleted based on priority.

14. The method of claim 13, wherein the priority is determined based on user preference.

15. The method of claim 10, wherein the content items are deleted based on at least one of play count and creation time.

16. The method of claim 1, wherein the universally resolvable list of content items includes at least one of: (i) a magic playlist, (ii) a dynamically created interest list, (iii) a shared playlist, (iv) a smart cache list, and (v) a shared library.

17. The method of claim 1, wherein the content items include at least one of music, books, videos, applications, user's media and user's media denoted by gurus, social, friends or favorites.

18. A non-local content item caching system, comprising:

a memory;

a processor disposed in communication with said memory, and configured to issue a plurality of processing instructions stored in the memory, wherein the processor issues instructions to:

obtain a universally resolvable list of content items on a local client;

identify a non-local item from the universally resolvable list of content items that is absent on the local client;

generate a local cache request for the identified non-local item having an associated universally resolvable content identifier;

transmit the generated local cache request to a universally resolvable content server;

receive, in response to the transmitted request, a universally resolvable content item corresponding to the local cache request; and

mark the requested item as temporary and locally available upon receiving the content item.

19. The system of claim 18, wherein the server queries a universally resolvable content database to retrieve the universally resolvable content item.

20. The system of claim 18, wherein identifying the non-local item includes conducting a search for the non-local item on the local client.

21. The system of claim 18, wherein the locally available content item is engageable as it is partially downloaded.

22. The system of claim 18, wherein the locally available content item is engageable as it is fully downloaded.

23. The system of claim 18, wherein the universally resolvable content identifier is a track identifier (ID).

24. The system of claim 23, wherein identifying the non-local item includes comparing track identifiers associated local items in the local client to the obtained list of track identifiers.

25. The system of claim 18, wherein the local cache request includes at least a universally resolvable content service user identifier and a universally resolvable content identifier associated with the identified non-local item.

26. The system of claim 18, wherein the processor issues further instructions to:

store the received universally resolvable content item corresponding to the local cache request in a cache in the local client.

27. The system of claim 18, wherein the processor issues further instructions to:

delete one or more content items in the cache local client prior to the storing.

28. The system of claim 27, wherein the content items are deleted based on last hit time.

29. The system of claim 27, wherein the content items are deleted based on content item size.

30. The system of claim 27, wherein the content items are deleted based on priority.

31. The system of claim 27, wherein the priority is determined based on user preference.

32. The system of claim 27 wherein the content items are deleted based on at least one of play count and creation time.

33. The system of claim 18, wherein the universally resolvable list of content items includes at least one of: (i) a magic playlist, (ii) a dynamically created interest list, (iii) a shared playlist, (iv) a smart cache list, and (v) a shared library.

34. The system of claim 18, wherein the content items include at least one of music, books, videos, applications, user's media and user's media denoted by gurus, social, friends or favorites.

35. A non-local content caching processor-readable medium storing processor-issuable instructions, comprising:

obtain a universally resolvable list of content items on a local client;

identify a non-local item from the universally resolvable list of content items that is absent on the local client;

generate a local cache request for the identified non-local item having an associated universally resolvable content identifier;

transmit the generated local cache request to a universally resolvable content server;

receive, in response to the transmitted request, a universally resolvable content item corresponding to the local cache request; and

mark the requested item as temporary and locally available upon receiving the content item.

36. The medium of claim 35, wherein the server queries a universally resolvable content database to retrieve the universally resolvable content item.

37. The medium of claim 35, wherein identifying the non-local item includes conducting a search for the non-local item on the local client.

38. The medium of claim 35, wherein the locally available content item is engageable as it is partially downloaded.

39. The medium of claim 35, wherein the locally available content item is engageable as it is fully downloaded.

40. The medium of claim 35, wherein the universally resolvable content identifier is a track identifier (ID).

41. The medium of claim 35, wherein identifying the non-local item includes comparing track identifiers associated local items in the local client to the obtained list of track identifiers.

42. The medium of claim 35, wherein the local cache request includes at least a universally resolvable content service user identifier and a universally resolvable content identifier associated with the identified non-local item.

43. The medium of claim 35, wherein the processor issues further instructions to:

store the received universally resolvable content item corresponding to the local cache request in a cache in the local client.

44. The medium of claim 35, wherein the processor issues further instructions to:

delete one or more content items in the cache local client prior to the storing.

45. The medium of claim 44, wherein the content items are deleted based on last hit time.

46. The medium of claim 44, wherein the content items are deleted based on content item size.

47. The medium of claim 44, wherein the content items are deleted based on priority.

48. The medium of claim 47, wherein the priority is determined based on user preference.

49. The medium of claim 44 wherein the content items are deleted based on at least one of play count and creation time.

50. The medium of claim 35, wherein the universally resolvable list of content items includes at least one of: (i) a magic playlist, (ii) a dynamically created interest list, (iii) a shared playlist, (iv) a smart cache list, and (v) a shared library.

51. The medium of claim 35, wherein the content items include at least one of music, books, videos, applications, user's media and user's media denoted by gurus, social, friends or favorites.

52. A non-local content item caching apparatus, comprising:

a memory:

a processor disposed in communication with said memory, and configured to issue a plurality of processing instructions stored in the memory, wherein the processor issues instructions to:

obtain a universally resolvable list of content items on a local client;

identify a non-local item from the universally resolvable list of content items that is absent on the local client;

generate a local cache request for the identified non-local item having an associated universally resolvable content identifier;

transmit the generated local cache request to a universally resolvable content server;

receive, in response to the transmitted request, a universally resolvable content item corresponding to the local cache request; and

mark the requested item as temporary and locally available upon receiving the content item.

53. The apparatus of claim 52, wherein the server queries a universally resolvable content database to retrieve the universally resolvable content item.

54. The apparatus of claim 52, wherein identifying the non-local item includes conducting a search for the non-local item on the local client.

55. The apparatus of claim 52, wherein the locally available content item is engageable as it is partially downloaded.

56. The apparatus of claim 52, wherein the locally available content item is engageable as it is fully downloaded.

57. The apparatus of claim 52, wherein the universally resolvable content identifier is a track identifier (ID).

58. The apparatus of claim 52, wherein identifying the non-local item includes comparing track identifiers associated local items in the local client to the obtained list of track identifiers.

59. The apparatus of claim 52, wherein the local cache request includes at least a universally resolvable content service user identifier and a universally resolvable content identifier associated with the identified non-local item.

60. The apparatus of claim 52, wherein the processor issues further instructions to:

store the received universally resolvable content item corresponding to the local cache request in a cache in the local client.

61. The apparatus of claim 52, wherein the processor issues further instructions to:

delete one or more content items in the cache local client prior to the storing.

62. The apparatus of claim 61, wherein the content items are deleted based on last hit time.

63. The apparatus of claim 61, wherein the content items are deleted based on content item size.

64. The apparatus of claim 61, wherein the content items are deleted based on priority.

65. The apparatus of claim 64, wherein the priority is determined based on user preference.

66. The apparatus of claim 61 wherein the content items are deleted based on at least one of play count and creation time.

67. The system of claim 52, wherein the universally resolvable list of content items includes at least one of: (i) a magic playlist, (ii) a dynamically created interest list, (iii) a shared playlist, (iv) a smart cache list, and (v) a shared library.

68. The system of claim 52, wherein the content items include at least one of music, books, videos, applications, user's media and user's media denoted by gurus, social, friends or favorites.

69. A non-local content caching processor-implemented method, comprising:

providing a universally resolvable list of content items to a client;

obtaining an identification of a non-local item from the universally resolvable list of content items that is absent from the client;

obtaining a cache request for the identified non-local item having an associated universally resolvable content identifier;

providing, in response to the obtained request, a universally resolvable content item corresponding to the cache request; and

updating the requested item as temporary and locally available.

70. The method of claim 69, further comprising querying a universally resolvable content database to retrieve the universally resolvable content item.

71. The method of claim 69, wherein obtaining the identification of the non-local item includes conducting a search for the non-local item on the local client.

72. The method of claim 69, wherein the locally available content item is engageable as it is partially downloaded.

73. The method of claim 69, wherein the locally available content item is engageable as it is fully downloaded.

74. The method of claim 69, wherein the universally resolvable content identifier is a track identifier (ID).

75. The method of claim 74, wherein obtaining the identification of the non-local item includes comparing track identifiers associated local items in the local client to the obtained list of track identifiers.

76. The method of claim 69, wherein the cache request includes at least a universally resolvable content service user identifier and a universally resolvable content identifier associated with the identified non-local item.

77. The method of claim 69, further comprising:

providing the universally resolvable content item corresponding to the cache request for storage in a cache in the client.

78. The method of claim 77, further comprising:

obtaining an indication of deletion of one or more content items in the cache of the client prior to providing the content item for storage.

79. The method of claim 78 wherein the content items are deleted based on last hit time.

80. The method of claim 78, wherein the content items are deleted based on content item size.

81. The method of claim 78, wherein the content items are deleted based on priority.

82. The method of claim 81, wherein the priority is determined based on user preference.

83. The method of claim 78, wherein the content items are deleted based on at least one of play count and creation time.

84. The method of claim 69, wherein the universally resolvable list of content items includes at least one of: (i) a magic playlist, (ii) a dynamically created interest list, (iii) a shared playlist, (iv) a smart cache list, and (v) a shared library.

85. The method of claim 69, wherein the content items include at least one of music, books, videos, applications, user's media and user's media denoted by gurus, social, friends or favorites.

86. A non-local content item caching system, comprising:

a memory;

a processor disposed in communication with said memory, and configured to issue a plurality of processing instructions stored in the memory, wherein the processor issues instructions to:

provide a universally resolvable list of content items to a client;

obtain an identification of a non-local item from the universally resolvable list of content items that is absent from the client;

obtain a cache request for the identified non-local item having an associated universally resolvable content identifier;

provide, in response to the obtained request, a universally resolvable content item corresponding to the cache request; and

update the requested item as temporary and locally available.

87. The system of claim 86, wherein the processor issues further instructions to query a universally resolvable content database to retrieve the universally resolvable content item.

88. The system of claim 86, wherein the processor issues further instructions to obtain the identification of the non-local item includes conducting a search for the non-local item on the local client.

89. The system of claim 86, wherein the locally available content item is engageable as it is partially downloaded.

90. The system of claim 86, wherein the locally available content item is engageable as it is fully downloaded.

91. The system of claim 86, wherein the universally resolvable content identifier is a track identifier (ID).

92. The system of claim 91, wherein the instructions to obtain the identification of the non-local item includes instructions to compare track identifiers associated local items in the local client to the obtained list of track identifiers.

93. The system of claim 86, wherein the cache request includes at least a universally resolvable content service user identifier and a universally resolvable content identifier associated with the identified non-local item.

94. The system of claim 86, wherein the processor issues further instructions to:

provide the universally resolvable content item corresponding to the cache request for storage in a cache in the client.

95. The system of claim 94, wherein the processor issues further instructions to:

obtaining an indication of deletion of one or more content items in the cache of the client prior to providing the content item for storage.

96. The system of claim 95 wherein the content items are deleted based on last hit time.

97. The system of claim 95, wherein the content items are deleted based on content item size.

98. The system of claim 95, wherein the content items are deleted based on priority.

99. The system of claim 81, wherein the priority is determined based on user preference.

100. The system of claim 95, wherein the content items are deleted based on at least one of play count and creation time.

101. The system of claim 86, wherein the universally resolvable list of content items includes at least one of: (i) a magic playlist, (ii) a dynamically created interest list, (iii) a shared playlist, (iv) a smart cache list, and (v) a shared library.

102. The system of claim 86, wherein the content items include at least one of music, books, videos, applications, user's media and user's media denoted by gurus, social, friends or favorites.

103. A non-local content caching processor-readable medium storing processor-issuable instructions, comprising:

provide a universally resolvable list of content items to a client;

obtain an identification of a non-local item from the universally resolvable list of content items that is absent from the client;

obtain a cache request for the identified non-local item having an associated universally resolvable content identifier;

provide, in response to the obtained request, a universally resolvable content item corresponding to the cache request; and

update the requested item as temporary and locally available.

104. The medium of claim 103, wherein the processor issues further instructions to query a universally resolvable content database to retrieve the universally resolvable content item.

105. The medium of claim 103, wherein the processor issues further instructions to obtain the identification of the non-local item includes conducting a search for the non-local item on the local client.

106. The medium of claim 103, wherein the locally available content item is engageable as it is partially downloaded.

107. The medium of claim 103, wherein the locally available content item is engageable as it is fully downloaded.

108. The medium of claim 103, wherein the universally resolvable content identifier is a track identifier (ID).

109. The medium of claim 108, wherein the instructions to obtain the identification of the non-local item includes instructions to compare track identifiers associated local items in the local client to the obtained list of track identifiers.

110. The medium of claim 103, wherein the cache request includes at least a universally resolvable content service user identifier and a universally resolvable content identifier associated with the identified non-local item.

111. The medium of claim 103, wherein the processor issues further instructions to:

provide the universally resolvable content item corresponding to the cache request for storage in a cache in the client.

112. The medium of claim 111, wherein the processor issues further instructions to:

obtaining an indication of deletion of one or more content items in the cache of the client prior to providing the content item for storage.

113. The medium of claim 112 wherein the content items are deleted based on last hit time.

114. The medium of claim 112, wherein the content items are deleted based on content item size.

115. The medium of claim 112, wherein the content items are deleted based on priority.

116. The medium of claim 115, wherein the priority is determined based on user preference.

117. The medium of claim 112, wherein the content items are deleted based on at least one of play count and creation time.

118. The medium of claim 103, wherein the universally resolvable list of content items includes at least one of: (i) a magic playlist, (ii) a dynamically created interest list, (iii) a shared playlist, (iv) a smart cache list, and (v) a shared library.

119. The medium of claim 103, wherein the content items include at least one of music, books, videos, applications, user's media and user's media denoted by gurus, social, friends or favorites.

120. An apparatus, comprising:

a memory;

a processor disposed in communication with said memory, and configured to issue a plurality of processing instructions stored in the memory, wherein the processor issues instructions to:

provide a universally resolvable list of content items to a client;

obtain an identification of a non-local item from the universally resolvable list of content items that is absent from the client;

obtain a cache request for the identified non-local item having an associated universally resolvable content identifier;

provide, in response to the obtained request, a universally resolvable content item corresponding to the cache request; and

update the requested item as temporary and locally available.

121. The apparatus of claim 120, wherein the processor issues further instructions to query a universally resolvable content database to retrieve the universally resolvable content item.

122. The apparatus of claim 120, wherein the processor issues further instructions to obtain the identification of the non-local item includes conducting a search for the non-local item on the local client.

123. The apparatus of claim 120, wherein the locally available content item is engageable as it is partially downloaded.

124. The apparatus of claim 120, wherein the locally available content item is engageable as it is fully downloaded.

125. The apparatus of claim 120, wherein the universally resolvable content identifier is a track identifier (ID).

126. The apparatus of claim 125, wherein the instructions to obtain the identification of the non-local item includes instructions to compare track identifiers associated local items in the local client to the obtained list of track identifiers.

127. The apparatus of claim 120, wherein the cache request includes at least a universally resolvable content service user identifier and a universally resolvable content identifier associated with the identified non-local item.

128. The apparatus of claim 120, wherein the processor issues further instructions to:

provide the universally resolvable content item corresponding to the cache request for storage in a cache in the client.

129. The apparatus of claim 128, wherein the processor issues further instructions to:

obtain an indication of deletion of one or more content items in the cache of the client prior to providing the content item for storage.

130. The apparatus of claim 129 wherein the content items are deleted based on last hit time.

131. The apparatus of claim 129, wherein the content items are deleted based on content item size.

132. The apparatus of claim 129, wherein the content items are deleted based on priority.

133. The apparatus of claim 132, wherein the priority is determined based on user preference.

134. The apparatus of claim 129, wherein the content items are deleted based on at least one of play count and creation time.

135. The apparatus of claim 120, wherein the universally resolvable list of content items includes at least one of: (i) a magic playlist, (ii) a dynamically created interest list, (iii) a shared playlist, (iv) a smart cache list, and (v) a shared library.

136. The apparatus of claim 120, wherein the content items include at least one of music, books, videos, applications, user's media and user's media denoted by gurus, social, friends or favorites.

137. An apportionment heuristics based caching processor-implemented method, comprising:

obtaining content discovery supportive information for a universally resolvable user;

determining apportionment heuristics among the obtained information for the user;

identifying a first set of universally resolvable content items based on the determined apportionment heuristics;

creating a caching queue that includes the identified first set of universally resolvable content items; and

providing the first set of universally resolvable content items in the caching queue to the user.

138. The method of claim 137, wherein providing the first set of universally resolvable content items is in response to a request for transmission that is triggered when a client device bandwidth usage is below a pre-determined threshold.

139. The method of claim 137, wherein providing the first set of universally resolvable content items is in response to a request for transmission that is triggered in accordance with user specified caching criteria.

140. The method of claim 137, wherein the first set of universally resolvable content items are arranged in a predefined download order in the caching queue.

141. The method of claim 137, wherein the apportionment heuristics includes the user's entity graph.

142. The method of claim 141, wherein the user's entity graph includes at least one of a social graph and an interest graph.

143. The method of claim 137, wherein the apportionment heuristics includes user-specific usage.

144. The method of claim 137, wherein the apportionment heuristics includes aggregate usage.

145. The method of claim 137, wherein the apportionment heuristics includes preference profile.

146. The method of claim 145, wherein the preference profile is associated with at least one of a user or a group of users, and indicative of preference for at least one of: (i) genres, (ii) artists, (iii) albums, (iv) tracks, (v) music attributes, (vi) location based preferences, and (vii) time based preferences.

147. The method of claim 137, wherein the apportionment heuristics includes social recommendation.

148. The method of claim 137, wherein the content discovery supportive information is updated based on an activity associated with one or more users.

149. The method of claim 148, further comprising:

obtaining the updated content discovery supportive information for the universally resolvable content user;

determining updated apportionment heuristics among the obtained updated information for the user;

identifying a second set of universally resolvable content items based on the determined updated apportionment heuristics;

updating the caching queue that includes the identified second set of universally resolvable content items; and

providing the second set of universally resolvable content items in the updated caching queue to the user.

150. The method of claim 149, wherein the second set of universally resolvable content items includes at least one content item from the first set of universally resolvable content items.

151. The method of claim 137, wherein the content discovery supportive information includes at least one of: most frequently played content item, content item rated high, content item rated low, content item shared and content item bookmarked.

152. An apportionment heuristics based caching system, comprising:

a memory;

a processor disposed in communication with said memory, and configured to issue a plurality of processing instructions stored in the memory, wherein the processor issues instructions to:

obtain content discovery supportive information for a universally resolvable user;

determine apportionment heuristics among the obtained information for the user;

identify a first set of universally resolvable content items based on the determined apportionment heuristics;

create a caching queue that includes the identified first set of universally resolvable content items; and

provide the first set of universally resolvable content items in the caching queue to the user.

153. The system of claim 152, wherein providing the first set of universally resolvable content items is in response to a request for transmission that is triggered when a client device bandwidth usage is below a pre-determined threshold.

154. The system of claim 152, wherein the instructions to provide the first set of universally resolvable content items is in response to a request for transmission that is triggered in accordance with user specified caching criteria.

155. The system of claim 152, wherein the first set of universally resolvable content items are arranged in a predefined download order in the caching queue.

156. The system of claim 152, wherein the apportionment heuristics includes the user's entity graph.

157. The system of claim 156, wherein the user's entity graph includes at least one of a social graph and an interest graph.

158. The system of claim 152, wherein the apportionment heuristics includes user-specific usage.

159. The system of claim 152, wherein the apportionment heuristics includes aggregate usage.

160. The system of claim 152, wherein the apportionment heuristics includes preference profile.

161. The system of claim 160, wherein the preference profile is associated with at least one of a user or a group of users, and indicative of preference for at least one of: (i) genres, (ii) artists, (iii) albums, (iv) tracks, (v) music attributes, (vi) location based preferences, and (vii) time based preferences.

162. The system of claim 152, wherein the apportionment heuristics includes social recommendation.

163. The system of claim 152, wherein the content discovery supportive information is updated based on an activity associated with one or more users.

164. The system of claim 163, wherein the processor issues further instructions to:

obtain the updated content discovery supportive information for the universally resolvable content user;

determine updated apportionment heuristics among the obtained updated information for the user;

identify a second set of universally resolvable content items based on the determined updated apportionment heuristics;

update the caching queue that includes the identified second set of universally resolvable content items; and

provide the second set of universally resolvable content items in the updated caching queue to the user.

165. The system of claim 164, wherein the second set of universally resolvable content items includes at least one content item from the first set of universally resolvable content items.

166. The system of claim 152, wherein the content discovery supportive information includes at least one of: most frequently played content item, content item rated high, content item rated low, content item shared and content item bookmarked.

167. An apportionment heuristics based caching processor-readable medium storing processor-issuable instructions, comprising:

obtain content discovery supportive information for a universally resolvable user;

determine apportionment heuristics among the obtained information for the user;

identify a first set of universally resolvable content items based on the determined apportionment heuristics;

create a caching queue that includes the identified first set of universally resolvable content items; and

provide the first set of universally resolvable content items in the caching queue to the user.

168. The medium of claim 167, wherein providing the first set of universally resolvable content items is in response to a request for transmission that is triggered when a client device bandwidth usage is below a pre-determined threshold.

169. The medium of claim 167, wherein the instructions to provide the first set of universally resolvable content items is in response to a request for transmission that is triggered in accordance with user specified caching criteria.

170. The medium of claim 167 wherein the first set of universally resolvable content items are arranged in a predefined download order in the caching queue.

171. The medium of claim 167, wherein the apportionment heuristics includes the user's entity graph.

172. The medium of claim 171, wherein the user's entity graph includes at least one of a social graph and an interest graph.

173. The medium of claim 167, wherein the apportionment heuristics includes user-specific usage.

174. The medium of claim 167, wherein the apportionment heuristics includes aggregate usage.

175. The medium of claim 167, wherein the apportionment heuristics includes preference profile.

176. The medium of claim 175, wherein the preference profile is associated with at least one of a user or a group of users, and indicative of preference for at least one of: (i) genres, (ii) artists, (iii) albums, (iv) tracks, (v) music attributes, (vi) location based preferences, and (vii) time based preferences.

177. The medium of claim 167, wherein the apportionment heuristics includes social recommendation.

178. The medium of claim 167, wherein the content discovery supportive information is updated based on an activity associated with one or more users.

179. The medium of claim 178, wherein the processor issues further instructions to:

obtain the updated content discovery supportive information for the universally resolvable content user;

determine updated apportionment heuristics among the obtained updated information for the user;

identify a second set of universally resolvable content items based on the determined updated apportionment heuristics;

update the caching queue that includes the identified second set of universally resolvable content items; and

provide the second set of universally resolvable content items in the updated caching queue to the user.

180. The medium of claim 179, wherein the second set of universally resolvable content items includes at least one content item from the first set of universally resolvable content items.

181. The medium of claim 167, wherein the content discovery supportive information includes at least one of: most frequently played content item, content item rated high, content item rated low, content item shared and content item bookmarked.

182. An apportionment heuristics based caching apparatus, comprising:

a memory;

a processor disposed in communication with said memory, and configured to issue a plurality of processing instructions stored in the memory, wherein the processor issues instructions to:

obtain content discovery supportive information for a universally resolvable user;

determine apportionment heuristics among the obtained information for the user;

identify a first set of universally resolvable content items based on the determined apportionment heuristics;

create a caching queue that includes the identified first set of universally resolvable content items; and

provide the first set of universally resolvable content items in the caching queue to the user.

183. The apparatus of claim 182, wherein providing the first set of universally resolvable content items is in response to a request for transmission that is triggered when a client device bandwidth usage is below a pre-determined threshold.

184. The apparatus of claim 182, wherein the instructions to provide the first set of universally resolvable content items is in response to a request for transmission that is triggered in accordance with user specified caching criteria.

185. The apparatus of claim 182, wherein the first set of universally resolvable content items are arranged in a predefined download order in the caching queue.

186. The apparatus of claim 182, wherein the apportionment heuristics includes the user's entity graph.

187. The apparatus of claim 186, wherein the user's entity graph includes at least one of a social graph and an interest graph.

188. The apparatus of claim 182, wherein the apportionment heuristics includes user-specific usage.

189. The apparatus of claim 182, wherein the apportionment heuristics includes aggregate usage.

190. The apparatus of claim 182, wherein the apportionment heuristics includes preference profile.

191. The apparatus of claim 160, wherein the preference profile is associated with at least one of a user or a group of users, and indicative of preference for at least one of: (i) genres, (ii) artists, (iii) albums, (iv) tracks, (v) music attributes, (vi) location based preferences, and (vii) time based preferences.

192. The apparatus of claim 182, wherein the apportionment heuristics includes social recommendation.

193. The apparatus of claim 182, wherein the content discovery supportive information is updated based on an activity associated with one or more users.

194. The apparatus of claim 193, wherein the processor issues further instructions to:

obtain the updated content discovery supportive information for the universally resolvable content user;

determine updated apportionment heuristics among the obtained updated information for the user;

identify a second set of universally resolvable content items based on the determined updated apportionment heuristics;

update the caching queue that includes the identified second set of universally resolvable content items; and

provide the second set of universally resolvable content items in the updated caching queue to the user.

195. The apparatus of claim 194, wherein the second set of universally resolvable content items includes at least one content item from the first set of universally resolvable content items.

196. The apparatus of claim 182, wherein the content discovery supportive information includes at least one of: most frequently played content item, content item rated high, content item rated low, content item shared and content item bookmarked.

197. An apportionment heuristics based caching processor-implemented method, comprising:

providing content discovery supportive information for a universally resolvable user;

providing an indication of apportionment heuristics among the obtained information for the user;

obtaining an identification of a first set of universally resolvable content items based on the determined apportionment heuristics;

obtaining an indication of creation of a caching queue that includes the identified first set of universally resolvable content items; and

obtaining the first set of universally resolvable content items in the caching queue to the user.

198. The method of claim 197, wherein obtaining the first set of universally resolvable content items is in response to a request for transmission that is triggered when a client device bandwidth usage is below a pre-determined threshold.

199. The method of claim 197, wherein obtaining the first set of universally resolvable content items is in response to a request for transmission that is triggered in accordance with user specified caching criteria.

200. The method of claim 197, wherein the first set of universally resolvable content items are arranged in a predefined download order in the caching queue.

201. The method of claim 197, wherein the apportionment heuristics includes the user's entity graph.

202. The method of claim 201, wherein the user's entity graph includes at least one of a social graph and an interest graph.

203. The method of claim 197, wherein the apportionment heuristics includes user-specific usage.

204. The method of claim 197, wherein the apportionment heuristics includes aggregate usage.

205. The method of claim 197, wherein the apportionment heuristics includes preference profile.

206. The method of claim 205, wherein the preference profile is associated with at least one of a user or a group of users, and indicative of preference for at least one of: (i) genres, (ii) artists, (iii) albums, (iv) tracks, (v) music attributes, (vi) location based preferences, and (vii) time based preferences.

207. The method of claim 197, wherein the apportionment heuristics includes social recommendation.

208. The method of claim 197, wherein the content discovery supportive information is updated based on an activity associated with one or more users.

209. The method of claim 208, further comprising:

providing the updated content discovery supportive information for the universally resolvable content user;

obtaining an indication of determination of updated apportionment heuristics among the obtained updated information for the user;

obtaining an indication of identification of a second set of universally resolvable content items based on the determined updated apportionment heuristics;

obtaining the caching queue that includes the identified second set of universally resolvable content items; and

obtaining the second set of universally resolvable content items in the updated caching queue to the user.

210. The method of claim 209, wherein the second set of universally resolvable content items includes at least one content item from the first set of universally resolvable content items.

211. The method of claim 197, wherein the content discovery supportive information includes at least one of: most frequently played content item, content item rated high, content item rated low, content item shared and content item bookmarked.

212. An apportionment heuristics based caching system, comprising:

a memory;

a processor disposed in communication with said memory, and configured to issue a plurality of processing instructions stored in the memory, wherein the processor issues instructions to:

provide content discovery supportive information for a universally resolvable user;

obtain an indication of determination of apportionment heuristics among the obtained information for the user;

obtain an indication of identification of a first set of universally resolvable content items based on the determined apportionment heuristics;

obtain a caching queue that includes the identified first set of universally resolvable content items; and

obtain the first set of universally resolvable content items in the caching queue to the user.

213. The system of claim 212, wherein obtaining the first set of universally resolvable content items is in response to a request for transmission that is triggered when a client device bandwidth usage is below a pre-determined threshold.

214. The system of claim 212, wherein the instructions to obtain the first set of universally resolvable content items is in response to a request for transmission that is triggered in accordance with user specified caching criteria.

215. The system of claim 212, wherein the first set of universally resolvable content items are arranged in a predefined download order in the caching queue.

216. The system of claim 212, wherein the apportionment heuristics includes the user's entity graph.

217. The system of claim 216, wherein the user's entity graph includes at least one of a social graph and an interest graph.

218. The system of claim 212, wherein the apportionment heuristics includes user-specific usage.

219. The system of claim 212, wherein the apportionment heuristics includes aggregate usage.

220. The system of claim 212, wherein the apportionment heuristics includes preference profile.

221. The system of claim 220, wherein the preference profile is associated with at least one of a user or a group of users, and indicative of preference for at least one of: (i) genres, (ii) artists, (iii) albums, (iv) tracks, (v) music attributes, (vi) location based preferences, and (vii) time based preferences.

222. The system of claim 212, wherein the apportionment heuristics includes social recommendation.

223. The system of claim 212, wherein the content discovery supportive information is updated based on an activity associated with one or more users.

224. The system of claim 223, wherein the processor issues further instructions to:

provide the updated content discovery supportive information for the universally resolvable content user;

obtain an indication of determination of updated apportionment heuristics among the obtained updated information for the user;

obtain an indication of identification of a second set of universally resolvable content items based on the determined updated apportionment heuristics;

obtaining an indication of update of the caching queue that includes the identified second set of universally resolvable content items; and

obtaining the second set of universally resolvable content items in the updated caching queue to the user.

225. The system of claim 224, wherein the second set of universally resolvable content items includes at least one content item from the first set of universally resolvable content items.

226. The system of claim 212, wherein the content discovery supportive information includes at least one of: most frequently played content item, content item rated high, content item rated low, content item shared and content item bookmarked.

227. An apportionment heuristics based caching processor-readable medium storing processor-issuable instructions, comprising:

provide content discovery supportive information for a universally resolvable user;

obtain apportionment heuristics among the obtained information for the user;

obtain a first set of universally resolvable content items based on the determined apportionment heuristics;

obtain a caching queue that includes the identified first set of universally resolvable content items; and

obtain the first set of universally resolvable content items in the caching queue to the user.

228. The medium of claim 227, wherein the instructions to obtain the first set of universally resolvable content items is in response to a request for transmission that is triggered when a client device bandwidth usage is below a pre-determined threshold.

229. The medium of claim 227, wherein the instructions to provide the first set of universally resolvable content items is in response to a request for transmission that is triggered in accordance with user specified caching criteria.

230. The medium of claim 227 wherein the first set of universally resolvable content items are arranged in a predefined download order in the caching queue.

231. The medium of claim 227, wherein the apportionment heuristics includes the user's entity graph.

232. The medium of claim 231, wherein the user's entity graph includes at least one of a social graph and an interest graph.

233. The medium of claim 227, wherein the apportionment heuristics includes user-specific usage.

234. The medium of claim 227, wherein the apportionment heuristics includes aggregate usage.

235. The medium of claim 227, wherein the apportionment heuristics includes preference profile.

236. The medium of claim 235, wherein the preference profile is associated with at least one of a user or a group of users, and indicative of preference for at least one of: (i) genres, (ii) artists, (iii) albums, (iv) tracks, (v) music attributes, (vi) location based preferences, and (vii) time based preferences.

237. The medium of claim 227, wherein the apportionment heuristics includes social recommendation.

238. The medium of claim 227, wherein the content discovery supportive information is updated based on an activity associated with one or more users.

239. The medium of claim 238, wherein the processor issues further instructions to:

provide the updated content discovery supportive information for the universally resolvable content user;

obtain an indication of determination of updated apportionment heuristics among the obtained updated information for the user;

obtain an identification of a second set of universally resolvable content items based on the determined updated apportionment heuristics;

obtain an indication to update the caching queue that includes the identified second set of universally resolvable content items; and

obtain the second set of universally resolvable content items in the updated caching queue to the user.

240. The medium of claim 239, wherein the second set of universally resolvable content items includes at least one content item from the first set of universally resolvable content items.

241. The medium of claim 227, wherein the content discovery supportive information includes at least one of: most frequently played content item, content item rated high, content item rated low, content item shared and content item bookmarked.

242. An apportionment heuristics based caching apparatus, comprising:

a memory;

a processor disposed in communication with said memory, and configured to issue a plurality of processing instructions stored in the memory, wherein the processor issues instructions to:

provide content discovery supportive information for a universally resolvable user;

obtain an indication of determination of apportionment heuristics among the obtained information for the user;

obtain an indication of identification of a first set of universally resolvable content items based on the determined apportionment heuristics;

obtain a caching queue that includes the identified first set of universally resolvable content items; and

obtain the first set of universally resolvable content items in the caching queue to the user.

243. The apparatus of claim 242, wherein providing the first set of universally resolvable content items is in response to a request for transmission that is triggered when a client device bandwidth usage is below a pre-determined threshold.

244. The apparatus of claim 242, wherein the instructions to provide the first set of universally resolvable content items is in response to a request for transmission that is triggered in accordance with user specified caching criteria.

245. The apparatus of claim 242, wherein the first set of universally resolvable content items are arranged in a predefined download order in the caching queue.

246. The apparatus of claim 242, wherein the apportionment heuristics includes the user's entity graph.

247. The apparatus of claim 246, wherein the user's entity graph includes at least one of a social graph and an interest graph.

248. The apparatus of claim 242, wherein the apportionment heuristics includes user-specific usage.

249. The apparatus of claim 242, wherein the apportionment heuristics includes aggregate usage.

250. The apparatus of claim 242, wherein the apportionment heuristics includes preference profile.

251. The apparatus of claim 250, wherein the preference profile is associated with at least one of a user or a group of users, and indicative of preference for at least one of: (i) genres, (ii) artists, (iii) albums, (iv) tracks, (v) music attributes, (vi) location based preferences, and (vii) time based preferences.

252. The apparatus of claim 242, wherein the apportionment heuristics includes social recommendation.

253. The apparatus of claim 242, wherein the content discovery supportive information is updated based on an activity associated with one or more users.

254. The apparatus of claim 253, wherein the processor issues further instructions to:

provide the updated content discovery supportive information for the universally resolvable content user;

obtain an indication of determination of updated apportionment heuristics among the obtained updated information for the user;

obtain an indication of identification of a second set of universally resolvable content items based on the determined updated apportionment heuristics;

obtain an indication of update of the caching queue that includes the identified second set of universally resolvable content items; and

obtain the second set of universally resolvable content items in the updated caching queue to the user.

255. The apparatus of claim 254, wherein the second set of universally resolvable content items includes at least one content item from the first set of universally resolvable content items.

256. The apparatus of claim 242, wherein the content discovery supportive information includes at least one of: most frequently played content item, content item rated high, content item rated low, content item shared and content item bookmarked.

257. A processor-implemented method for providing shared access to a media content collection, comprising:

obtaining from a first universally resolvable media content service user a request to share the user's universally resolvable media content collection;

obtaining from the first user a selection of at least one second universally resolvable user;

configuring the first user's media content collection with restricted shared access controls for the second user; and

providing the second user restricted shared access to the shared media content collection based on the configured restricted shared access controls.

258. The method of claim 257, further comprising:

receiving from one of a plurality of shared users having access to the shared media content collection a request to perform an action on the shared media content collection;

performing said action on the shared media content collection to obtain a modified shared media content collection; and

providing the plurality of shared users access to the modified shared media content collection.

259. The method of claim 257, further comprising:

downloading non-local content items of the shared media content collection to client devices of a plurality of shared users having access to the shared media content collection, wherein the plurality of shared users includes at least the first user and the second user.

260. The method of claim 259, wherein the non-local content items are downloaded in the cache.

261. The method of claim 257, wherein the shared media collection is stored in a universally resolvable content database in a server.

262. The method of claim 258, wherein said action is selected from any of: (i) add a content item, (ii) remove a content item, (iii) re-order content items, (iv) modify privacy settings, (v) share with another universally resolvable user, (vi) delete the shared media collection, (vii) create a playlist, (viii) add an entity graph member, (ix) publish media collection, and (x) change meta data for a content item.

263. The method of claim 257, wherein prior to receiving from the first user the request to share the first user's media content collection:

receiving from the first user a request to create the media content collection; and

receiving from the first user at least one content item for including in the created media content collection.

264. The method of claim 257, wherein the media collection any one of: (i) a universally resolvable media content service user created media content collection, and (ii) a system generated media content collection.

265. The method of claim 257, further comprising:

configuring access by other universally resolvable media content service users to the shared media collection based on the first user selected access constraints.

266. The method of claim 265, wherein the access constraints define read only access to the shared media content collection to any one of: (i) friends having a predetermined degree of separation, (ii) Gurus, (iii) social network members having a predetermined degree of separation, (iv) relationship categories, and (v) everyone.

267. The method of claim 257, further comprising:

receiving a request from the second user to perform an action on the shared media content collection; and

obtaining from the first user an acceptance or a denial to the received request to perform the action on the shared media content collection.

268. The method of claim 267, wherein when said acceptance is obtained,

performing said action on the shared media content collection to obtain a modified shared media content collection; and

providing the modified shared media content collection to the first user and the second user; and

when said denial is obtained,

providing the second user a request declined message.

269. The method of claim 257, wherein the media content collection includes: (i) a playlist, (ii) at least one content item, (iii) a media library in the cloud, and (iv) a media library in a local client.

270. The method of claim 257, wherein said configuring includes obtaining the first user specified content parameters and access control parameters for the content.

271. The method of claim 257, further comprising:

determining a subset of the first user's media content collection that is restricted by the first user's access control parameters for access by the second user.

272. A system for providing shared access to a media content collection, comprising:

a memory;

a processor disposed in communication with said memory, and configured to issue a plurality of processing instructions stored in the memory, wherein the processor issues instructions to:

obtain from a first universally resolvable media content service user a request to share the user's universally resolvable media content collection;

obtain from the first user a selection of at least one second universally resolvable user;

configure the first user's media content collection for shared access with the second user; and

provide the second user access to the shared media content collection.

273. The system of claim 272, wherein the processor issues further instructions to:

receive from one of a plurality of shared users having access to the shared media content collection a request to perform an action on the shared media content collection;

perform said action on the shared media content collection to obtain a modified shared media content collection; and

provide the plurality of shared users access to the modified shared media content collection.

274. The system of claim 273, wherein said action is selected from any of: (i) add a content item, (ii) remove a content item, (iii) re-order content items, (iv) modify privacy settings, (v) share with another universally resolvable user, (vi) delete the shared media collection, (vii) create a playlist, (viii) add an entity graph member, (ix) publish media collection, and (x) change meta data for a content item.

275. The system of claim 272, wherein the processor issues further instructions to:

download non-local content items of the shared media content collection to client devices of a plurality of shared users having access to the shared media content collection, wherein the plurality of shared users includes at least the first user and the second user.

276. The system of claim 275, wherein the non-local content items are downloaded in the cache.

277. The system of claim 272, wherein the shared media collection is stored in a universally resolvable content database in a server.

278. The system of claim 272, wherein prior to issuing instructions to receive from the first user the request to share the first user's media content collection, the processor issues instruction to;

receive from the first user a request to create the media content collection; and

receive from the first user at least one content item for including in the created media content collection.

279. The system of claim 272, wherein the media collection any one of: (i) a universally resolvable media content service user created media content collection, and (ii) a system generated media content collection.

280. The system of claim 272, wherein the processor issues further instructions to:

configure access by other universally resolvable media content service users to the shared media collection based on the first user selected access constraints.

281. The system of claim 280, wherein the access constraints define read only access to the shared media content collection to any one of: (i) friends having a predetermined degree of separation, (ii) Gurus, (iii) social network members having a predetermined degree of separation, (iv) relationship categories, and (v) everyone.

282. The system of claim 272, wherein the processor issues further instructions to:

receive a request from the second user to perform an action on the shared media content collection; and

obtain from the first user an acceptance or a denial to the received request to perform the action on the shared media content collection.

283. The system of claim 282, wherein when said acceptance is obtained, the processor issues instructions to:

perform said action on the shared media content collection to obtain a modified shared media content collection; and

provide the modified shared media content collection to the first user and the second user; and

when said denial is obtained, the processor issues instructions to:

provide the second user a request declined message.

284. The system of claim 272, wherein the media content collection includes: (i) a playlist, (ii) at least one content item, (iii) a media library in the cloud, and (iv) a media library in a local client.

285. The system of claim 272, wherein said instructions to configure includes instructions to obtain the first user specified content parameters and access control parameters for the content.

286. The system of claim 272, wherein said processor issues further instructions to:

determine a subset of the first user's media content collection that is restricted by the first user's access control parameters for access by the second user.

287. A processor-readable medium storing processor-issuable instructions for providing shared access to a media content collection, wherein the processor issues instructions to:

obtain from a first universally resolvable media content service user a request to share the user's universally resolvable media content collection;

obtain from the first user a selection of at least one second universally resolvable user;

configure the first user's media content collection for shared access with the second user; and

provide the second user access to the shared media content collection.

288. The medium of claim 287, wherein the processor issues further instructions to:

receive from one of a plurality of shared users having access to the shared media content collection a request to perform an action on the shared media content collection;

perform said action on the shared media content collection to obtain a modified shared media content collection; and

provide the plurality of shared users access to the modified shared media content collection.

289. The medium tem of claim 288, wherein said action is selected from any of: (i) add a content item, (ii) remove a content item, (iii) re-order content items, (iv) modify privacy settings, (v) share with another universally resolvable user, (vi) delete the shared media collection, (vii) create a playlist, (viii) add an entity graph member, (ix) publish media collection, and (x) change meta data for a content item.

290. The medium of claim 287, wherein the processor issues further instructions to:

download non-local content items of the shared media content collection to client devices of a plurality of shared users having access to the shared media content collection, wherein the plurality of shared users includes at least the first user and the second user.

291. The medium of claim 290, wherein the non-local content items are downloaded in the cache.

292. The medium of claim 287, wherein the shared media collection is stored in a universally resolvable content database in a server.

293. The medium of claim 287, wherein prior to issuing instructions to receive from the first user the request to share the first user's media content collection, the processor issues instruction to;

receive from the first user a request to create the media content collection; and

receive from the first user at least one content item for including in the created media content collection.

294. The medium of claim 287, wherein the media collection any one of: (i) a universally resolvable media content service user created media content collection, and (ii) a system generated media content collection.

295. The medium of claim 287, wherein the processor issues further instructions to:

configure access by other universally resolvable media content service users to the shared media collection based on the first user selected access constraints.

296. The medium of claim 295, wherein the access constraints define read only access to the shared media content collection to any one of: (i) friends having a predetermined degree of separation, (ii) Gurus, (iii) social network members having a predetermined degree of separation, (iv) relationship categories, and (v) everyone.

297. The medium of claim 287, wherein the processor issues further instructions to:

receive a request from the second user to perform an action on the shared media content collection; and

obtain from the first user an acceptance or a denial to the received request to perform the action on the shared media content collection.

298. The medium of claim 297, wherein when said acceptance is obtained, the processor issues instructions to:

perform said action on the shared media content collection to obtain a modified shared media content collection; and

provide the modified shared media content collection to the first user and the second user; and

when said denial is obtained, the processor issues instructions to:

provide the second user a request declined message.

299. The medium of claim 287, wherein the media content collection includes: (i) a playlist, (ii) at least one content item, (iii) a media library in the cloud, and (iv) a media library in a local client.

300. The medium of claim 287, wherein said instructions to configure includes instructions to obtain the first user specified content parameters and access control parameters for the content.

301. The medium of claim 287, wherein said processor issues further instructions to:

determine a subset of the first user's media content collection that is restricted by the first user's access control parameters for access by the second user.

302. An apparatus for providing shared access to a media content collection, comprising:

a memory;

a processor disposed in communication with said memory, and configured to issue a plurality of processing instructions stored in the memory, wherein the processor issues instructions to:

obtain from a first universally resolvable media content service user a request to share the user's universally resolvable media content collection;

obtain from the first user a selection of at least one second universally resolvable user;

configure the first user's media content collection for shared access with the second user; and

provide the second user access to the shared media content collection.

303. The apparatus of claim 302, wherein the processor issues further instructions to:

receive from one of a plurality of shared users having access to the shared media content collection a request to perform an action on the shared media content collection;

perform said action on the shared media content collection to obtain a modified shared media content collection; and

provide the plurality of shared users access to the modified shared media content collection.

304. The apparatus of claim 303, wherein said action is selected from any of: (i) add a content item, (ii) remove a content item, (iii) re-order content items, (iv) modify privacy settings, (v) share with another universally resolvable user, (vi) delete the shared media collection, (vii) create a playlist, (viii) add an entity graph member, (ix) publish media collection, and (x) change meta data for a content item.

305. The apparatus of claim 302, wherein the processor issues further instructions to:

download non-local content items of the shared media content collection to client devices of a plurality of shared users having access to the shared media content collection, wherein the plurality of shared users includes at least the first user and the second user.

306. The apparatus of claim 305, wherein the non-local content items are downloaded in the cache.

307. The apparatus of claim 302, wherein the shared media collection is stored in a universally resolvable content database in a server.

308. The apparatus of claim 302, wherein prior to issuing instructions to receive from the first user the request to share the first user's media content collection, the processor issues instruction to;

receive from the first user a request to create the media content collection; and

receive from the first user at least one content item for including in the created media content collection.

309. The apparatus of claim 302, wherein the media collection any one of: (i) a universally resolvable media content service user created media content collection, and (ii) a system generated media content collection.

310. The apparatus of claim 302, wherein the processor issues further instructions to:

configure access by other universally resolvable media content service users to the shared media collection based on the first user selected access constraints.

311. The apparatus of claim 310, wherein the access constraints define read only access to the shared media content collection to any one of: (i) friends having a predetermined degree of separation, (ii) Gurus, (iii) social network members having a predetermined degree of separation, (iv) relationship categories, and (v) everyone.

312. The apparatus of claim 302, wherein the processor issues further instructions to:

receive a request from the second user to perform an action on the shared media content collection; and

obtain from the first user an acceptance or a denial to the received request to perform the action on the shared media content collection.

313. The apparatus of claim 282, wherein when said acceptance is obtained, the processor issues instructions to:

perform said action on the shared media content collection to obtain a modified shared media content collection; and

provide the modified shared media content collection to the first user and the second user; and

when said denial is obtained, the processor issues instructions to:

provide the second user a request declined message.

314. The apparatus of claim 302, wherein the media content collection includes: (i) a playlist, (ii) at least one content item, (iii) a media library in the cloud, and (iv) a media library in a local client.

315. The apparatus of claim 302, wherein said instructions to configure includes instructions to obtain the first user specified content parameters and access control parameters for the content.

316. The apparatus of claim 302, wherein said processor issues further instructions to:

determine a subset of the first user's media content collection that is restricted by the first user's access control parameters for access by the second user.

317. A processor-implemented method, comprising:

providing from a first universally resolvable media content service user a request to share the user's universally resolvable media content collection;

providing from the first user a selection of at least one second universally resolvable user;

providing authorization to configuring the first user's media content collection with restricted shared access controls for the second user; and

providing authorization to provide the second user restricted shared access to the shared media content collection based on the configured restricted shared access controls.

318. The method of claim 317, further comprising:

providing to one of a plurality of shared users having access to the shared media content collection a request to perform an action on the shared media content collection;

providing authorization to perform said action on the shared media content collection to obtain a modified shared media content collection; and

obtaining for the plurality of shared users access to the modified shared media content collection.

319. The method of claim 317, further comprising:

providing authorization to download non-local content items of the shared media content collection to client devices of a plurality of shared users having access to the shared media content collection, wherein the plurality of shared users includes at least the first user and the second user.

320. The method of claim 319, wherein the non-local content items are downloaded in the cache.

321. The method of claim 317, wherein the shared media collection is stored in a universally resolvable content database in a server.

322. The method of claim 318, wherein said action is selected from any of: (i) add a content item, (ii) remove a content item, (iii) re-order content items, (iv) modify privacy settings, (v) share with another universally resolvable user, (vi) delete the shared media collection, (vii) create a playlist, (viii) add an entity graph member, (ix) publish media collection, and (x) change meta data for a content item.

323. The method of claim 317, wherein prior to providing from the first user the request to share the first user's media content collection:

providing from the first user a request to create the media content collection; and

providing from the first user at least one content item for including in the created media content collection.

324. The method of claim 317, wherein the media collection any one of: (i) a universally resolvable media content service user created media content collection, and (ii) a system generated media content collection.

325. The method of claim 317, further comprising:

providing authorization to configure access by other universally resolvable media content service users to the shared media collection based on the first user selected access constraints.

326. The method of claim 325, wherein the access constraints define read only access to the shared media content collection to any one of: (i) friends having a predetermined degree of separation, (ii) Gurus, (iii) social network members having a predetermined degree of separation, (iv) relationship categories, and (v) everyone.

327. The method of claim 317, further comprising:

providing a request from the second user to perform an action on the shared media content collection; and

providing from the first user an acceptance or a denial to the received request to perform the action on the shared media content collection.

328. The method of claim 327, wherein when said acceptance is obtained,

providing authorization to perform said action on the shared media content collection to obtain a modified shared media content collection; and

obtaining the modified shared media content collection to the first user and the second user; and

when said denial is obtained,

obtaining the second user a request declined message.

329. The method of claim 317, wherein the media content collection includes: (i) a playlist, (ii) at least one content item, (iii) a media library in the cloud, and (iv) a media library in a local client.

330. The method of claim 317, wherein said configuring includes obtaining the first user specified content parameters and access control parameters for the content.

331. The method of claim 317, further comprising:

obtaining an indication of determination of a subset of the first user's media content collection that is restricted by the first user's access control parameters for access by the second user.

332. A system for providing shared access to a media content collection, comprising:

a memory;

a processor disposed in communication with said memory, and configured to issue a plurality of processing instructions stored in the memory, wherein the processor issues instructions to:

provide from a first universally resolvable media content service user a request to share the user's universally resolvable media content collection;

provide from the first user a selection of at least one second universally resolvable user;

provide authorization to configure the first user's media content collection for shared access with the second user; and

provide authorization to the second user access to the shared media content collection.

333. The system of claim 332, wherein the processor issues further instructions to:

provide from one of a plurality of shared users having access to the shared media content collection a request to perform an action on the shared media content collection;

provide authorization to perform said action on the shared media content collection to obtain a modified shared media content collection; and

obtain the plurality of shared users access to the modified shared media content collection.

334. The system of claim 333, wherein said action is selected from any of: (i) add a content item, (ii) remove a content item, (iii) re-order content items, (iv) modify privacy settings, (v) share with another universally resolvable user, (vi) delete the shared media collection, (vii) create a playlist, (viii) add an entity graph member, (ix) publish media collection, and (x) change meta data for a content item.

335. The system of claim 332, wherein the processor issues further instructions to:

provide authorization to download non-local content items of the shared media content collection to client devices of a plurality of shared users having access to the shared media content collection, wherein the plurality of shared users includes at least the first user and the second user.

336. The system of claim 335, wherein the non-local content items are downloaded in the cache.

337. The system of claim 332, wherein the shared media collection is stored in a universally resolvable content database in a server.

338. The system of claim 332, wherein prior to issuing instructions to receive from the first user the request to share the first user's media content collection, the processor issues instruction to;

receive from the first user a request to create the media content collection; and

receive from the first user at least one content item for including in the created media content collection.

339. The system of claim 332, wherein the media collection any one of: (i) a universally resolvable media content service user created media content collection, and (ii) a system generated media content collection.

340. The system of claim 332, wherein the processor issues further instructions to:

configure access by other universally resolvable media content service users to the shared media collection based on the first user selected access constraints.

341. The system of claim 330, wherein the access constraints define read only access to the shared media content collection to any one of: (i) friends having a predetermined degree of separation, (ii) Gurus, (iii) social network members having a predetermined degree of separation, (iv) relationship categories, and (v) everyone.

342. The system of claim 332, wherein the processor issues further instructions to:

receive a request from the second user to perform an action on the shared media content collection; and

obtain from the first user an acceptance or a denial to the received request to perform the action on the shared media content collection.

343. The system of claim 342, wherein when said acceptance is obtained, the processor issues instructions to:

perform said action on the shared media content collection to obtain a modified shared media content collection; and

provide the modified shared media content collection to the first user and the second user; and

when said denial is obtained, the processor issues instructions to:

provide the second user a request declined message.

344. The system of claim 332, wherein the media content collection includes: (i) a playlist, (ii) at least one content item, (iii) a media library in the cloud, and (iv) a media library in a local client.

345. The system of claim 332, wherein said instructions to configure includes instructions to obtain the first user specified content parameters and access control parameters for the content.

346. The system of claim 332, wherein said processor issues further instructions to:

determine a subset of the first user's media content collection that is restricted by the first user's access control parameters for access by the second user.

347. A processor-readable medium storing processor-issuable instructions for providing shared access to a media content collection, wherein the processor issues instructions to:

provide from a first universally resolvable media content service user a request to share the user's universally resolvable media content collection;

provide from the first user a selection of at least one second universally resolvable user;

provide authorization to configure the first user's media content collection for shared access with the second user; and

provide authorization to provide the second user access to the shared media content collection.

348. The medium of claim 347, wherein the processor issues further instructions to:

provide from one of a plurality of shared users having access to the shared media content collection a request to perform an action on the shared media content collection;

provide authorization to perform said action on the shared media content collection to obtain a modified shared media content collection; and

obtain the plurality of shared users access to the modified shared media content collection.

349. The medium of claim 348, wherein said action is selected from any of: (i) add a content item, (ii) remove a content item, (iii) re-order content items, (iv) modify privacy settings, (v) share with another universally resolvable user, (vi) delete the shared media collection, (vii) create a playlist, (viii) add an entity graph member, (ix) publish media collection, and (x) change meta data for a content item.

350. The medium of claim 347, wherein the processor issues further instructions to:

provide authorization to download non-local content items of the shared media content collection to client devices of a plurality of shared users having access to the shared media content collection, wherein the plurality of shared users includes at least the first user and the second user.

351. The medium of claim 350, wherein the non-local content items are downloaded in the cache.

352. The medium of claim 347, wherein the shared media collection is stored in a universally resolvable content database in a server.

353. The medium of claim 347, wherein prior to issuing instructions to receive from the first user the request to share the first user's media content collection, the processor issues instruction to;

provide from the first user a request to create the media content collection; and

provide from the first user at least one content item for including in the created media content collection.

354. The medium of claim 347, wherein the media collection any one of: (i) a universally resolvable media content service user created media content collection, and (ii) a system generated media content collection.

355. The medium of claim 347, wherein the processor issues further instructions to:

provide authorization to configure access by other universally resolvable media content service users to the shared media collection based on the first user selected access constraints.

356. The medium of claim 355, wherein the access constraints define read only access to the shared media content collection to any one of: (i) friends having a predetermined degree of separation, (ii) Gurus, (iii) social network members having a predetermined degree of separation, (iv) relationship categories, and (v) everyone.

357. The medium of claim 347, wherein the processor issues further instructions to:

provide a request from the second user to perform an action on the shared media content collection; and

provide from the first user an acceptance or a denial to the received request to perform the action on the shared media content collection.

358. The medium of claim 357, wherein when said acceptance is obtained, the processor issues instructions to:

provide authorization to perform said action on the shared media content collection to obtain a modified shared media content collection; and

obtain the modified shared media content collection to the first user and the second user; and

when said denial is obtained, the processor issues instructions to:

provide authorization to provide the second user a request declined message.

359. The medium of claim 347, wherein the media content collection includes: (i) a playlist, (ii) at least one content item, (iii) a media library in the cloud, and (iv) a media library in a local client.

360. The medium of claim 347, wherein said instructions to configure includes instructions to obtain the first user specified content parameters and access control parameters for the content.

361. The medium of claim 347, wherein said processor issues further instructions to:

provide authorization to determine a subset of the first user's media content collection that is restricted by the first user's access control parameters for access by the second user.

362. An apparatus for providing shared access to a media content collection, comprising:

a memory;

a processor disposed in communication with said memory, and configured to issue a plurality of processing instructions stored in the memory, wherein the processor issues instructions to:

provide from a first universally resolvable media content service user a request to share the user's universally resolvable media content collection;

provide from the first user a selection of at least one second universally resolvable user;

provide authorization to configure the first user's media content collection for shared access with the second user; and

provide authorization to provide the second user access to the shared media content collection.

363. The apparatus of claim 362, wherein the processor issues further instructions to:

obtain from one of a plurality of shared users having access to the shared media content collection a request to perform an action on the shared media content collection;

provide authorization to perform said action on the shared media content collection to obtain a modified shared media content collection; and

obtain the plurality of shared users access to the modified shared media content collection.

364. The apparatus of claim 363, wherein said action is selected from any of: (i) add a content item, (ii) remove a content item, (iii) re-order content items, (iv) modify privacy settings, (v) share with another universally resolvable user, (vi) delete the shared media collection, (vii) create a playlist, (viii) add an entity graph member, (ix) publish media collection, and (x) change meta data for a content item.

365. The apparatus of claim 362, wherein the processor issues further instructions to:

provide authorization to download non-local content items of the shared media content collection to client devices of a plurality of shared users having access to the shared media content collection, wherein the plurality of shared users includes at least the first user and the second user.

366. The apparatus of claim 365, wherein the non-local content items are downloaded in the cache.

367. The apparatus of claim 362, wherein the shared media collection is stored in a universally resolvable content database in a server.

368. The apparatus of claim 362, wherein prior to issuing instructions to receive from the first user the request to share the first user's media content collection, the processor issues instruction to;

provide from the first user a request to create the media content collection; and

provide from the first user at least one content item for including in the created media content collection.

369. The apparatus of claim 362, wherein the media collection any one of: (i) a universally resolvable media content service user created media content collection, and (ii) a system generated media content collection.

370. The apparatus of claim 362, wherein the processor issues further instructions to:

provide authorization to configure access by other universally resolvable media content service users to the shared media collection based on the first user selected access constraints.

371. The apparatus of claim 370, wherein the access constraints define read only access to the shared media content collection to any one of: (i) friends having a predetermined degree of separation, (ii) Gurus, (iii) social network members having a predetermined degree of separation, (iv) relationship categories, and (v) everyone.

372. The apparatus of claim 362, wherein the processor issues further instructions to:

provide a request from the second user to perform an action on the shared media content collection; and

provide from the first user an acceptance or a denial to the received request to perform the action on the shared media content collection.

373. The apparatus of claim 372, wherein when said acceptance is obtained, the processor issues instructions to:

provide authorization to perform said action on the shared media content collection to obtain a modified shared media content collection; and

obtain the modified shared media content collection to the first user and the second user; and

when said denial is obtained, the processor issues instructions to:

obtain the second user a request declined message.

374. The apparatus of claim 362, wherein the media content collection includes: (i) a playlist, (ii) at least one content item, (iii) a media library in the cloud, and (iv) a media library in a local client.

375. The apparatus of claim 362, wherein said instructions to configure includes instructions to obtain the first user specified content parameters and access control parameters for the content.

376. The apparatus of claim 362, wherein said processor issues further instructions to:

provide authorization to determine a subset of the first user's media content collection that is restricted by the first user's access control parameters for access by the second user.

377. A processor-implemented method for providing access to a portion of a media library, comprising:

receiving from a first universally resolvable user a request to access a media library of a second universally resolvable user;

retrieving the second user specified privacy controls;

applying the second user specified privacy controls to determine a portion of the media library permitted for shared access by the first user; and

allowing the first user access to the determined portion of the media library.

378. The method of claim 377, further comprising:

determining a degree of separation between the first user and the second user; and

applying the degree of separation as an access constraint to the media library of the second user.

379. The method of claim 377, further comprising:

receiving a request from the first user to download at least one content item located in the determined portion of the media library; and

in response to the received request to download the at least one content item, providing the at least one content item in the first user's media library.

380. The method of claim 377, wherein access by the first user includes modification of the second user's media library.

381. The method of claim 380, wherein the modification of the second user's media library includes at least one of: (i) adding a local content item, (ii) removing a content item, (iii) adding a social graph member, and (iv) creating a playlist.

382. The method of claim 381, wherein the content item includes: (i) a playlist, (ii) entity graph, (iii) music, (iv) movie, (v) book, and (vi) video.

383. The method of claim 380, wherein the playlist is a shared playlist modifiable by the first user and the second user.

384. The method of claim 377, wherein the portion of the media library permitted for access by the first user includes at least one of: (i) albums, (ii) genre, (iii) artists, (iv) purchased, (v) playlist, and (vii) all content.

385. A system for providing access to a portion of a media library, comprising:

a memory;

a processor disposed in communication with said memory, and configured to issue a plurality of processing instructions stored in the memory, wherein the processor issues instructions to:

receive from a first universally resolvable user a request to access a media library of a second universally resolvable user;

retrieve the second user specified privacy controls;

apply the second user specified privacy controls to determine a portion of the media library permitted for access by the first user; and

allow the first user access to the determined portion of the media library.

386. The system of claim 385, wherein the processor issues further instructions to:

determine a degree of separation between the first user and the second user; and

apply the degree of separation as an access constraint to the media library of the second user.

387. The system of claim 385, wherein the processor issues further instructions to:

receive a request from the first user to download at least one content item located in the determined portion of the media library; and

in response to the received request to download the at least one content item, provide the at least one content item in the first user's media library.

388. The system of claim 385, wherein access by the first user includes modification of the second user's media library.

389. The system of claim 388, wherein the modification of the second user's media library includes at least one of: (i) adding a local content item, (ii) removing a content item, (iii) adding a social graph member, and (iv) creating a playlist.

390. The system of claim 389, wherein the content item includes: (i) a playlist, (ii) entity graph, (iii) music, (iv) movie, (v) book, and (vi) video.

391. The system of claim 390, wherein the playlist is a shared playlist modifiable by the first user and the second user.

392. The system of claim 385, wherein the portion of the media library permitted for access by the first user includes at least one of: (i) albums, (ii) genre, (iii) artists, (iv) purchased, (v) playlist, and (vii) all content.

393. A processor-readable medium storing processor-issuable instructions for providing access to a portion of a media library wherein the processor issues instructions to:

receive from a first universally resolvable user a request to access a media library of a second universally resolvable user;

retrieve the second user specified privacy controls;

apply the second user specified privacy controls to determine a portion of the media library permitted for access by the first user; and

allow the first user access to the determined portion of the media library.

394. The medium of claim 393, wherein the processor issues further instructions to:

determine a degree of separation between the first user and the second user; and

apply the degree of separation as an access constraint to the media library of the second user.

395. The medium of claim 393, wherein the processor issues further instructions to:

receive a request from the first user to download at least one content item located in the determined portion of the media library; and

in response to the received request to download the at least one content item, provide the at least one content item in the first user's media library.

396. The medium of claim 393, wherein access by the first user includes modification of the second user's media library.

397. The medium of claim 396, wherein the modification of the second user's media library includes at least one of: (i) adding a local content item, (ii) removing a content item, (iii) adding a social graph member, and (iv) creating a playlist.

398. The medium of claim 397, wherein the content item includes: (i) a playlist, (ii) entity graph, (iii) music, (iv) movie, (v) book, and (vi) video.

399. The medium of claim 398, wherein the playlist is a shared playlist modifiable by the first user and the second user.

400. The medium of claim 393, wherein the portion of the media library permitted for access by the first user includes at least one of: (i) albums, (ii) genre, (iii) artists, (iv) purchased, (v) playlist, and (vii) all content.

401. An apparatus for providing access to a portion of a media library wherein the processor issues instructions to:

a memory;

a processor disposed in communication with said memory, and configured to issue a plurality of processing instructions stored in the memory, wherein the processor issues instructions to:

receive from a first universally resolvable user a request to access a media library of a second universally resolvable user;

retrieve the second user specified privacy controls;

apply the second user specified privacy controls to determine a portion of the media library permitted for access by the first user; and

allow the first user access to the determined portion of the media library.

402. The apparatus of claim 401, wherein the processor issues further instructions to:

determine a degree of separation between the first user and the second user; and

apply the degree of separation as an access constraint to the media library of the second user.

403. The apparatus of claim 401, wherein the processor issues further instructions to:

receive a request from the first user to download at least one content item located in the determined portion of the media library; and

in response to the received request to download the at least one content item, provide the at least one content item in the first user's media library.

404. The apparatus of claim 401, wherein access by the first user includes modification of the second user's media library.

405. The apparatus of claim 404, wherein the modification of the second user's media library includes at least one of: (i) adding a local content item, (ii) removing a content item, (iii) adding a social graph member, and (iv) creating a playlist.

406. The apparatus of claim 405, wherein the content item includes: (i) a playlist, (ii) entity graph, (iii) music, (iv) movie, (v) book, and (vi) video.

407. The apparatus of claim 404, wherein the playlist is a shared playlist modifiable by the first user and the second user.

408. The apparatus of claim 401, wherein the portion of the media library permitted for access by the first user includes at least one of: (i) albums, (ii) genre, (iii) artists, (iv) purchased, (v) playlist, and (vii) all content.

409. A processor-implemented method for sharing a universally resolvable media content collection, comprising:

obtaining privacy settings for sharing a universally resolvable media content collection, said privacy settings identifying:

a selection of a universally resolvable media content collection; and

a selection of at least one universally resolvable user authorized to access the universally resolvable media content collection;

generating and transmitting a sharing request including the privacy settings;

receiving a confirmation that the universally resolvable media content collection is configured for sharing with the at least one universally resolvable user.

410. The method of claim 409, wherein the at least one universally resolvable user includes at least one of: (i) a friend having a specified degree of separation; (ii) a social network member having a specified degree of separation; (iii) a friend; (iv) a family; (v) an acquaintance; and (vi) a work friend.

411. The method of claim 409, wherein the at least one universally resolvable content collection includes at least one of: (i) all content items in the collection; (ii) most recently played; (iii) playlists; (iv) selected; (v) highest rated; (vi) purchased; and (vii) most frequently played.

412. The method of claim 409, further comprising:

receiving a request from a universally resolvable user to access a universally resolvable content collection.

413. The method of claim 412, further comprising:

in response to the request, allowing the universally resolvable user access the universally resolvable content collection.

414. The method of claim 412, further comprising:

in response to the request, denying the universally resolvable user access the at least one universally resolvable content collection.

415. A system for sharing a universally resolvable media content collection, comprising:

a memory;

a processor disposed in communication with said memory, and configured to issue a plurality of processing instructions stored in the memory, wherein the processor issues instructions to:

obtain privacy settings for sharing a universally resolvable media content collection, said privacy settings identifying:

a select of a universally resolvable media content collection; and

a select of at least one universally resolvable user authorized to access the universally resolvable media content collection;

generate and transmit a sharing request including the privacy settings;

receive a confirmation that the universally resolvable media content collection is configured for sharing with the at least one universally resolvable user.

416. The system of claim 415, wherein the at least one universally resolvable user includes at least one of: (i) a friend having a specified degree of separation; (ii) a social network member having a specified degree of separation; (iii) a friend; (iv) a family; (v) an acquaintance; and (vi) a work friend.

417. The system of claim 415, wherein the at least one universally resolvable content collection includes at least one of: (i) all content items in the collection; (ii) most recently played; (iii) playlists; (iv) selected; (v) highest rated; (vi) purchased; and (vii) most frequently played.

418. The system of claim 415, wherein the processor issues further instructions to:

receive a request from a universally resolvable user to access a universally resolvable content collection.

419. The system of claim 418, wherein in response to the request, the processor issues further instructions to allow the universally resolvable user access the universally resolvable content collection.

420. The system of claim 418, wherein in response to the request, the processor issues further instructions to deny the universally resolvable user access the at least one universally resolvable content collection.

421. A processor-readable medium storing processor-issuable instructions for providing access to a portion of a media library wherein the processor issues instructions to:

obtain privacy settings for sharing a universally resolvable media content collection, said privacy settings identifying:

a select of a universally resolvable media content collection; and

a select of at least one universally resolvable user authorized to access the universally resolvable media content collection;

generate and transmit a sharing request including the privacy settings;

receive a confirmation that the universally resolvable media content collection is configured for sharing with the at least one universally resolvable user.

422. The medium of claim 421, wherein the at least one universally resolvable user includes at least one of: (i) a friend having a specified degree of separation; (ii) a social network member having a specified degree of separation; (iii) a friend; (iv) a family; (v) an acquaintance; and (vi) a work friend.

423. The medium of claim 421, wherein the at least one universally resolvable content collection includes at least one of: (i) all content items in the collection; (ii) most recently played; (iii) playlists; (iv) selected; (v) highest rated; (vi) purchased; and (vii) most frequently played.

424. The medium of claim 421, wherein the processor issues further instructions to:

receive a request from a universally resolvable user to access a universally resolvable content collection.

425. The medium of claim 424, wherein in response to the request, the processor issues further instructions to allow the universally resolvable user access the universally resolvable content collection.

426. The medium of claim 424, wherein in response to the request, the processor issues further instructions to deny the universally resolvable user access the at least one universally resolvable content collection.

427. An apparatus for sharing a universally resolvable media content collection, comprising:

a memory;

a processor disposed in communication with said memory, and configured to issue a plurality of processing instructions stored in the memory, wherein the processor issues instructions to:

obtain privacy settings for sharing a universally resolvable media content collection, said privacy settings identifying:

a select of a universally resolvable media content collection; and

a select of at least one universally resolvable user authorized to access the universally resolvable media content collection;

generate and transmit a sharing request including the privacy settings;

receive a confirmation that the universally resolvable media content collection is configured for sharing with the at least one universally resolvable user.

428. The apparatus of claim 427, wherein the at least one universally resolvable user includes at least one of: (i) a friend having a specified degree of separation; (ii) a social network member having a specified degree of separation; (iii) a friend; (iv) a family; (v) an acquaintance; and (vi) a work friend.

429. The apparatus of claim 427, wherein the at least one universally resolvable content collection includes at least one of: (i) all content items in the collection; (ii) most recently played; (iii) playlists; (iv) selected; (v) highest rated; (vi) purchased; and (vii) most frequently played.

430. The apparatus of claim 427, wherein the processor issues further instructions to:

receive a request from a universally resolvable user to access a universally resolvable content collection.

431. The apparatus of claim 430, wherein in response to the request, the processor issues further instructions to allow the universally resolvable user access the universally resolvable content collection.

432. The apparatus of claim 430, wherein in response to the request, the processor issues further instructions to deny the universally resolvable user access the at least one universally resolvable content collection.

433. A processor-implemented method, comprising:

generating from a first universally resolvable user a request to access a media library of a second universally resolvable user;

retrieving the second user specified privacy controls;

supplying the second user specified privacy controls to determine a portion of the media library permitted for shared access by the first user; and

providing authorization to allow the first user access to the determined portion of the media library.

434. The method of claim 433, further comprising:

obtaining indication of determination of a degree of separation between the first user and the second user; and

providing authorization to apply the degree of separation as an access constraint to the media library of the second user.

435. The method of claim 433, further comprising:

providing a request from the first user to download at least one content item located in the determined portion of the media library; and

in response to the provided request to download the at least one content item, obtaining the at least one content item in the first user's media library.

436. The method of claim 433, wherein access by the first user includes modification of the second user's media library.

437. The method of claim 436, wherein the modification of the second user's media library includes at least one of: (i) adding a local content item, (ii) removing a content item, (iii) adding a social graph member, and (iv) creating a playlist.

438. The method of claim 437, wherein the content item includes: (i) a playlist, (ii) entity graph, (iii) music, (iv) movie, (v) book, and (vi) video.

439. The method of claim 436, wherein the playlist is a shared playlist modifiable by the first user and the second user.

440. The method of claim 433, wherein the portion of the media library permitted for access by the first user includes at least one of: (i) albums, (ii) genre, (iii) artists, (iv) purchased, (v) playlist, and (vii) all content.

441. A system for providing access to a portion of a media library, comprising:

a memory;

a processor disposed in communication with said memory, and configured to issue a plurality of processing instructions stored in the memory, wherein the processor issues instructions to:

generate from a first universally resolvable user a request to access a media library of a second universally resolvable user;

retrieve the second user specified privacy controls;

supply the second user specified privacy controls to determine a portion of the media library permitted for access by the first user; and

provide authorization to the first user access to the determined portion of the media library.

442. The system of claim 441, wherein the processor issues further instructions to:

obtain indication of determination of a degree of separation between the first user and the second user; and

supply the degree of separation as an access constraint to the media library of the second user.

443. The system of claim 441, wherein the processor issues further instructions to:

provide a request from the first user to download at least one content item located in the determined portion of the media library; and

in response to the request to download the at least one content item, obtain the at least one content item in the first user's media library.

444. The system of claim 441, wherein access by the first user includes modification of the second user's media library.

445. The system of claim 444, wherein the modification of the second user's media library includes at least one of: (i) adding a local content item, (ii) removing a content item, (iii) adding a social graph member, and (iv) creating a playlist.

446. The system of claim 445, wherein the content item includes: (i) a playlist, (ii) entity graph, (iii) music, (iv) movie, (v) book, and (vi) video.

447. The system of claim 446, wherein the playlist is a shared playlist modifiable by the first user and the second user.

448. The system of claim 441, wherein the portion of the media library permitted for access by the first user includes at least one of: (i) albums, (ii) genre, (iii) artists, (iv) purchased, (v) playlist, and (vii) all content.

449. A processor-readable medium storing processor-issuable instructions for providing access to a portion of a media library wherein the processor issues instructions to:

generate from a first universally resolvable user a request to access a media library of a second universally resolvable user;

retrieve the second user specified privacy controls;

aupply the second user specified privacy controls to determine a portion of the media library permitted for access by the first user; and

providing authorization to the first user access to the determined portion of the media library.

450. The medium of claim 449, wherein the processor issues further instructions to:

obtain indication of determination of a degree of separation between the first user and the second user; and

apply the degree of separation as an access constraint to the media library of the second user.

451. The medium of claim 449, wherein the processor issues further instructions to:

provide a request from the first user to download at least one content item located in the determined portion of the media library; and

in response to the request to download the at least one content item, provide the at least one content item in the first user's media library.

452. The medium of claim 449, wherein access by the first user includes modification of the second user's media library.

453. The medium of claim 452, wherein the modification of the second user's media library includes at least one of: (i) adding a local content item, (ii) removing a content item, (iii) adding a social graph member, and (iv) creating a playlist.

454. The medium of claim 453, wherein the content item includes: (i) a playlist, (ii) entity graph, (iii) music, (iv) movie, (v) book, and (vi) video.

455. The medium of claim 454, wherein the playlist is a shared playlist modifiable by the first user and the second user.

456. The medium of claim 449, wherein the portion of the media library permitted for access by the first user includes at least one of: (i) albums, (ii) genre, (iii) artists, (iv) purchased, (v) playlist, and (vii) all content.

457. An apparatus for providing access to a portion of a media library wherein the processor issues instructions to:

a memory;

a processor disposed in communication with said memory, and configured to issue a plurality of processing instructions stored in the memory, wherein the processor issues instructions to:

provide from a first universally resolvable user a request to access a media library of a second universally resolvable user;

retrieve the second user specified privacy controls;

supply the second user specified privacy controls to determine a portion of the media library permitted for access by the first user; and

provide authorization to the first user access to the determined portion of the media library.

458. The apparatus of claim 457, wherein the processor issues further instructions to:

obtain an indication of determination of a degree of separation between the first user and the second user; and

supply the degree of separation as an access constraint to the media library of the second user.

459. The apparatus of claim 457, wherein the processor issues further instructions to:

provide a request from the first user to download at least one content item located in the determined portion of the media library; and

in response to the request to download the at least one content item, obtain the at least one content item in the first user's media library.

460. The apparatus of claim 457, wherein access by the first user includes modification of the second user's media library.

461. The apparatus of claim 460, wherein the modification of the second user's media library includes at least one of: (i) adding a local content item, (ii) removing a content item, (iii) adding a social graph member, and (iv) creating a playlist.

462. The apparatus of claim 461, wherein the content item includes: (i) a playlist, (ii) entity graph, (iii) music, (iv) movie, (v) book, and (vi) video.

463. The apparatus of claim 460, wherein the playlist is a shared playlist modifiable by the first user and the second user.

464. The apparatus of claim 457, wherein the portion of the media library permitted for access by the first user includes at least one of: (i) albums, (ii) genre, (iii) artists, (iv) purchased, (v) playlist, and (vii) all content.

465. A processor-implemented method for sharing a universally resolvable media content collection, comprising:

providing privacy settings for sharing a universally resolvable media content collection, said privacy settings identifying:

a selection of a universally resolvable media content collection; and

a selection of at least one universally resolvable user authorized to access the universally resolvable media content collection;

providing authorization to generate and transmit a sharing request including the privacy settings;

providing a confirmation that the universally resolvable media content collection is configured for sharing with the at least one universally resolvable user.

466. The method of claim 465, wherein the at least one universally resolvable user includes at least one of: (i) a friend having a specified degree of separation; (ii) a social network member having a specified degree of separation; (iii) a friend; (iv) a family; (v) an acquaintance; and (vi) a work friend.

467. The method of claim 465, wherein the at least one universally resolvable content collection includes at least one of: (i) all content items in the collection; (ii) most recently played; (iii) playlists; (iv) selected; (v) highest rated; (vi) purchased; and (vii) most frequently played.

468. The method of claim 465, further comprising:

providing a request from a universally resolvable user to access a universally resolvable content collection.

469. The method of claim 468, further comprising:

in response to the request, providing authorization to allow the universally resolvable user access the universally resolvable content collection.

470. The method of claim 468, further comprising:

in response to the request, providing authorization to deny the universally resolvable user access the at least one universally resolvable content collection.

471. A system for sharing a universally resolvable media content collection, comprising:

a memory;

a processor disposed in communication with said memory, and configured to issue a plurality of processing instructions stored in the memory, wherein the processor issues instructions to:

provide privacy settings for sharing a universally resolvable media content collection, said privacy settings identifying:

a selection of a universally resolvable media content collection; and

a selection of at least one universally resolvable user authorized to access the universally resolvable media content collection;

providing authorization to generate and transmit a sharing request including the privacy settings;

provide a confirmation that the universally resolvable media content collection is configured for sharing with the at least one universally resolvable user.

472. The system of claim 471, wherein the at least one universally resolvable user includes at least one of: (i) a friend having a specified degree of separation; (ii) a social network member having a specified degree of separation; (iii) a friend; (iv) a family; (v) an acquaintance; and (vi) a work friend.

473. The system of claim 471, wherein the at least one universally resolvable content collection includes at least one of: (i) all content items in the collection; (ii) most recently played; (iii) playlists; (iv) selected; (v) highest rated; (vi) purchased; and (vii) most frequently played.

474. The system of claim 471, wherein the processor issues further instructions to:

provide a request from a universally resolvable user to access a universally resolvable content collection.

475. The system of claim 474, wherein in response to the request, the processor issues further instructions to provide authorization to allow the universally resolvable user access the universally resolvable content collection.

476. The system of claim 474, wherein in response to the request, the processor issues further instructions to provide authorization to deny the universally resolvable user access the at least one universally resolvable content collection.

477. A processor-readable medium storing processor-issuable instructions for providing access to a portion of a media library wherein the processor issues instructions to:

provide privacy settings for sharing a universally resolvable media content collection, said privacy settings identifying:

a selection of a universally resolvable media content collection; and

a selection of at least one universally resolvable user authorized to access the universally resolvable media content collection;

provide authorization to generate and transmit a sharing request including the privacy settings;

provide a confirmation that the universally resolvable media content collection is configured for sharing with the at least one universally resolvable user.

478. The medium of claim 477, wherein the at least one universally resolvable user includes at least one of: (i) a friend having a specified degree of separation; (ii) a social network member having a specified degree of separation; (iii) a friend; (iv) a family; (v) an acquaintance; and (vi) a work friend.

479. The medium of claim 477, wherein the at least one universally resolvable content collection includes at least one of: (i) all content items in the collection; (ii) most recently played; (iii) playlists; (iv) selected; (v) highest rated; (vi) purchased; and (vii) most frequently played.

480. The medium of claim 477, wherein the processor issues further instructions to:

receive a request from a universally resolvable user to access a universally resolvable content collection.

481. The medium of claim 480, wherein in response to the request, the processor issues further instructions to allow the universally resolvable user access the universally resolvable content collection.

482. The medium of claim 480, wherein in response to the request, the processor issues further instructions to deny the universally resolvable user access the at least one universally resolvable content collection.

483. An apparatus for sharing a universally resolvable media content collection, comprising:

a memory;

a processor disposed in communication with said memory, and configured to issue a plurality of processing instructions stored in the memory, wherein the processor issues instructions to:

provide privacy settings for sharing a universally resolvable media content collection, said privacy settings identifying:

a selection of a universally resolvable media content collection; and

a selection of at least one universally resolvable user authorized to access the universally resolvable media content collection;

provide authorization to generate and transmit a sharing request including the privacy settings;

provide a confirmation that the universally resolvable media content collection is configured for sharing with the at least one universally resolvable user.

484. The apparatus of claim 483, wherein the at least one universally resolvable user includes at least one of: (i) a friend having a specified degree of separation; (ii) a social network member having a specified degree of separation; (iii) a friend; (iv) a family; (v) an acquaintance; and (vi) a work friend.

485. The apparatus of claim 483, wherein the at least one universally resolvable content collection includes at least one of: (i) all content items in the collection; (ii) most recently played; (iii) playlists; (iv) selected; (v) highest rated; (vi) purchased; and (vii) most frequently played.

486. The apparatus of claim 483, wherein the processor issues further instructions to:

provide a request from a universally resolvable user to access a universally resolvable content collection.

487. The apparatus of claim 486, wherein in response to the request, the processor issues further instructions to provide authorization to allow the universally resolvable user access the universally resolvable content collection.

488. The apparatus of claim 486, wherein in response to the request, the processor issues further instructions to provide authorization to deny the universally resolvable user access the at least one universally resolvable content collection.

489. A graphical user interface, comprising:

a media display view, said media display view including a plurality of universally resolvable attribute rows, wherein each attribute row is configured to display universally resolvable attribute row items including social graph, wherein the media display view is configured to recursively:

obtain a selected content attribute row item;

display the selected content attribute row item in a corresponding attribute row of a first selection column;

identify related content attribute row items; and

provide the identified related content attribute row items for selection; and

display the selected related content attribute row item in a corresponding attribute row of a subsequent selection column.

490. The graphical user interface of claim 489, wherein the selection column establishes the sequence of selection of the content attribute row items.

491. The graphical user interface of claim 489, further comprising a media selection view displaying a designated spotlight area that is configured to receive the selected content attribute row item.

492. The graphical user interface of claim 491, wherein the selection of the content attribute row item is made by a user via one of (i) a single action, or (ii) a double action.

493. The graphical user interface of claim 492, wherein rows and columns are orthogonal and not spatially perpendicular.

494. The graphical user interface of claim 489, wherein the media display view is one of a plurality of media display views, wherein each media display view corresponds to a time period and is configured to:

obtain data corresponding to a plurality of content attribute row items spotlighted during the time period; and

display the obtained data in corresponding content attribute rows and selection columns.

495. The graphical user interface of claim 489, wherein the content attribute row items are selected from a group including: (i) artists, (ii) tracks, (iii) albums, (iv) playlists, (v) gurus, and (vi) social graph.

496. A processor-implemented method for displaying content items, comprising:

obtaining a user selection of a content attribute row item;

displaying the selected content attribute row item in a corresponding attribute row of a first selection column of a media display view;

identifying related content attribute row items; and

providing the identified related content attribute row items for selection; and

displaying the selected related content attribute row item in a corresponding attribute row of a subsequent selection column of the media display view.

497. The method of claim 496, wherein the selection column establishes the sequence of selection of the content attribute row items.

498. The method of claim 496, further comprising a media selection view displaying a designated spotlight area that is configured to receive the selected content attribute row item.

499. The method of claim 497, wherein the selection of the content attribute row item is made by a user via one of (i) a single action, or (ii) a double action.

500. The method of claim 489, wherein rows and columns are orthogonal and not spatially perpendicular.

501. The method of claim 496, wherein the media display view corresponds to a time period, the method further comprising:

obtaining data corresponding to a plurality of content attribute row items spotlighted during the time period; and

displaying the obtained data in corresponding content attribute rows and selection columns.

502. The method of claim 496, wherein the content attribute row items are selected from a group including: (i) artists, (ii) tracks, (iii) albums, (iv) playlists, (v) gurus, and (vi) social graph.

503. A system for displaying content items, comprising:

a memory;

a processor disposed in communication with said memory, and configured to issue a plurality of processing instructions stored in the memory, wherein the processor issues instructions to:

obtain a user selection of a content attribute row item;

display the selected content attribute row item in a corresponding attribute row of a first selection column of a media display view;

identify related content attribute row items; and

provide the identified related content attribute row items for selection; and

display the selected related content attribute row item in a corresponding attribute row of a subsequent selection column of the media display view.

504. The system of claim 503, wherein the selection column establishes the sequence of selection of the content attribute row items.

505. The system of claim 503, further comprising a media selection view wherein the processor issues instructions to display a designated spotlight area that is configured to receive the selected content attribute row item.

506. The system of claim 504, wherein the selection of the content attribute row item is made by a user via one of (i) a single action, or (ii) a double action.

507. The system of claim 503, wherein rows and columns are orthogonal and not spatially perpendicular.

508. The system of claim 503, wherein the media display view corresponds to a time period, and wherein the processor issues further instructions to:

obtain data corresponding to a plurality of content attribute row items spotlighted during the time period; and

display the obtained data in corresponding content attribute rows and selection columns.

509. The system of claim 503, wherein the content attribute row items are selected from a group including: (i) artists, (ii) tracks, (iii) albums, (iv) playlists, (v) gurus, and (vi) social graph.

510. A processor-readable medium storing processor-issuable instructions for displaying content items wherein the processor issues instructions to:

obtain a user selection of a content attribute row item;

display the selected content attribute row item in a corresponding attribute row of a first selection column of a media display view;

identify related content attribute row items; and

provide the identified related content attribute row items for selection; and

display the selected related content attribute row item in a corresponding attribute row of a subsequent selection column in the media display view.

511. The medium of claim 510, wherein the selection column establishes the sequence of selection of the content attribute row items.

512. The medium of claim 510, further comprising a media selection view wherein the processor issues instructions to display a designated spotlight area that is configured to receive the selected content attribute row item.

513. The medium of claim 511, wherein the selection of the content attribute row item is made by a user via one of (i) a single action, or (ii) a double action.

514. The medium of claim 510, wherein rows and columns are orthogonal and not spatially perpendicular.

515. The medium of claim 510, wherein each media display view corresponds to a time period, and wherein the processor issues further instructions to:

obtain data corresponding to a plurality of content attribute row items spotlighted during the time period; and

display the obtained data in corresponding content attribute rows and selection columns.

516. The medium of claim 510, wherein the content attribute row items are selected from a group including: (i) artists, (ii) tracks, (iii) albums, (iv) playlists, (v) gurus, and (vi) social graph.

517. A search and discovery interface, comprising:

an entry point representation surrounded by a plurality of discovery supportive heuristic representations,

wherein the entry point representation is configured to receive a first universally resolvable content item selected from one of the plurality of discovery supportive heuristic representations;

wherein the interface is configured to identify, for each of the plurality of discovery supportive heuristic representations, a universally resolvable content item related to the content item in the entry point representation; and

wherein each of the plurality of discovery supportive heuristic representations is configured to display the corresponding identified universally resolvable content item.

518. The interface of claim 517, wherein the plurality of discovery supportive heuristic representations include (i) track, (ii) artist, (iii) album, (iv) gurus, and (v) playlist.

519. The interface of claim 518, wherein the content item in each of the plurality of discovery supportive heuristic representations is the most related (i) track, (ii) artist, (iii) album, (iv) gurus, and (v) playlist.

520. The interface of claim 517, wherein the universally resolvable content seed in the entry point representation and in each one of the plurality of discovery supportive category representations is shareable with one or more users.

521. The interface of claim 517, wherein the universally resolvable content seed in the entry point representation and in each one of the plurality of discovery supportive category representations is downloadable to one or more client devices.

522. The interface of claim 517, wherein the universally resolvable content seed in the entry point representation and in each one of the plurality of discovery supportive category representations is includable in one or more playlists.

523. A processor-implemented search and discovery method, comprising:

receiving at an entry point representation a first universally resolvable content item seed selected from one of a plurality of discovery supportive heuristic representations;

obtaining for each of the plurality of discovery supportive heuristic representations a universally resolvable content item related to the content item seed; and

displaying at each of the plurality of discovery supportive heuristic representations the corresponding related universally resolvable content item.

524. The method of claim 523, wherein the plurality of discovery supportive heuristic representations include (i) track, (ii) artist, (iii) album, (iv) gurus, and (v) playlist.

525. The method of claim 524, wherein the content item in each of the plurality of discovery supportive heuristic representations is the most related (i) track, (ii) artist, (iii) album, (iv) gurus, and (v) playlist.

526. The method of claim 523, wherein the universally resolvable content seed in the entry point representation and in each one of the plurality of discovery supportive category representations is shareable with one or more users.

527. The method of claim 523, wherein the universally resolvable content seed in the entry point representation and in each one of the plurality of discovery supportive category representations is downloadable to one or more client devices.

528. The method of claim 523, wherein the universally resolvable content seed in the entry point representation and in each one of the plurality of discovery supportive category representations is includable in one or more playlists.

529. A search and discovery system, comprising:

a memory;

a processor disposed in communication with said memory, and configured to issue a plurality of processing instructions stored in the memory, wherein the processor issues instructions to:

receive at an entry point representation a first universally resolvable content item seed selected from one of a plurality of discovery supportive heuristic representations;

obtain for each of the plurality of discovery supportive heuristic representations a universally resolvable content item related to the content item seed; and

display at each of the plurality of discovery supportive heuristic representations the corresponding related universally resolvable content item.

530. The system of claim 529, wherein the plurality of discovery supportive heuristic representations include (i) track, (ii) artist, (iii) album, (iv) gurus, and (v) playlist.

531. The system of claim 530, wherein the content item in each of the plurality of discovery supportive heuristic representations is the most related (i) track, (ii) artist, (iii) album, (iv) gurus, and (v) playlist.

532. The system of claim 529, wherein the universally resolvable content seed in the entry point representation and in each one of the plurality of discovery supportive category representations is shareable with one or more users.

533. The system of claim 529, wherein the universally resolvable content seed in the entry point representation and in each one of the plurality of discovery supportive category representations is downloadable to one or more client devices.

534. The system of claim 529, wherein the universally resolvable content seed in the entry point representation and in each one of the plurality of discovery supportive category representations is includable in one or more playlists.

535. A processor-readable search and discovery medium storing processor-issuable instructions, wherein the processor issues instructions to:

receive at an entry point representation a first universally resolvable content item seed selected from one of a plurality of discovery supportive heuristic representations;

obtain for each of the plurality of discovery supportive heuristic representations a universally resolvable content item related to the content item seed; and

display at each of the plurality of discovery supportive heuristic representations the corresponding related universally resolvable content item.

536. The medium of claim 535, wherein the plurality of discovery supportive heuristic representations include (i) track, (ii) artist, (iii) album, (iv) gurus, and (v) playlist.

537. The medium of claim 536, wherein the content item in each of the plurality of discovery supportive heuristic representations is the most related (i) track, (ii) artist, (iii) album, (iv) gurus, and (v) playlist.

538. The medium of claim 535, wherein the universally resolvable content seed in the entry point representation and in each one of the plurality of discovery supportive category representations is shareable with one or more users.

539. The medium of claim 535, wherein the universally resolvable content seed in the entry point representation and in each one of the plurality of discovery supportive category representations is downloadable to one or more client devices.

540. The medium of claim 535, wherein the universally resolvable content seed in the entry point representation and in each one of the plurality of discovery supportive category representations is includable in one or more playlists.

541. A processor-implemented method for providing universally resolvable content items, comprising:

receiving user selection of a universally resolvable content seed;

determining via a processor socially influenced content attributes associated with the universally resolvable content seed;

querying a universally resolvable content database using the socially influenced content attributes;

obtaining a ranked list of universally resolvable content items from the querying;

providing the ranked list of universally resolvable content items to the user.

542. The method of claim 541, further comprising:

creating a content query based on the socially influenced content attributes for the querying.

543. The method of claim 542, further comprising:

creating socially influenced ranking categories and populating the ranking categories with results from the query to obtain the ranked list of universally resolvable content items.

544. The method of claim 541, wherein determining the socially influenced content attributes associated with the universally resolvable content seed includes:

determining if the universally resolvable content seed is a universally resolvable content item seed.

545. The method of claim 544, wherein when the universally resolvable content seed is a universally resolvable content item seed, determining the socially influenced content attributes includes:

retrieving user profile and social graph preferences;

utilizing the retrieved user profile and social graph preferences to create socially influenced ranking categories to obtain the ranked list of universally resolvable content items.

546. The method of claim 545, wherein the social graph preferences are derived from the user's one or more social networks.

547. The method of claim 544, wherein when the universally resolvable content seed is not a content item seed, determining the socially influenced content attributes further comprises:

selecting a socially influenced content item seed selection criterion; and

retrieving a universally resolvable content item seed associated with the universally resolvable content seed based on the selected criterion.

548. The method of claim 547, further comprising:

retrieving user profile and social graph preferences; and

utilizing the retrieved user profile and social graph preferences to create socially influenced ranking categories for obtaining the ranked list of universally resolvable content items.

549. The method of claim 547, wherein the socially influenced content item seed selection criterion is one of a: (i) a specified default, (ii) currently played track, (iii) most played track, (iv) favorite track, (v) favorite genre, and (vi) last purchase.

550. The method of claim 543, wherein the results from the query are assigned a weight corresponding to relevance to the content query.

551. The method of claim 550, wherein obtaining the ranked list of universally resolvable content item further comprises:

assigning a category weight to each one of the socially influenced ranking categories; and

ranking the socially influenced categorized results based on a calculated social influence score.

552. The method of claim 551, further comprising:

for each one of the unique results, calculating the social influence score based on the assigned category weight and the weight corresponding to relevance to the content query.

553. The method of claim 541, further comprising:

obtaining from the user's client device a local cache request for a non-local universally resolvable content item; and

providing the non-local universally resolvable content item to the user's client device.

554. The method of claim 551, wherein the non-local universally resolvable content item in the user's client device is marked as temporary.

555. The method of claim 541, further comprising:

determining via the processor interest graph influenced content attributes associated with the universally resolvable content seed;

querying the universally resolvable content database using the interest graph influenced content attributes;

obtaining a ranked list of universally resolvable content items from the querying;

providing the ranked list of universally resolvable content items to the user.

556. A system for providing universally resolvable content items, comprising:

a memory;

a processor disposed in communication with said memory, and configured to issue a plurality of processing instructions stored in the memory, wherein the processor issues instructions to:

receive user selection of a universally resolvable content seed;

determine via a processor socially influenced content attributes associated with the universally resolvable content seed;

query a universally resolvable content database using the socially influenced content attributes;

obtain a ranked list of universally resolvable content items from the querying; and

provide the ranked list of universally resolvable content items to the user.

557. The system of claim 556, wherein the processor issues further instructions to:

create a content query based on the socially influenced content attributes for the querying.

558. The system of claim 557, wherein the processor issues further instructions to:

create socially influenced ranking categories and populating the ranking categories with results from the query to obtain the ranked list of universally resolvable content items.

559. The system of claim 556, wherein the instructions to determine the socially influenced content attributes associated with the universally resolvable content seed includes instructions to:

determine if the universally resolvable content seed is a universally resolvable content item seed.

560. The system of claim 559, wherein when the universally resolvable content seed is a universally resolvable content item seed, the instructions to determine the socially influenced content attributes includes instructions to:

retrieve user profile and social graph preferences;

utilize the retrieved user profile and social graph preferences to create socially influenced ranking categories to obtain the ranked list of universally resolvable content items.

561. The system of claim 560, wherein the social graph preferences are derived from the user's one or more social networks.

562. The system of claim 559, wherein when the universally resolvable content seed is not a content item seed, the instructions to determine the socially influenced content attributes further comprises instructions to:

select a socially influenced content item seed selection criterion; and

retrieve a universally resolvable content item seed associated with the universally resolvable content seed based on the selected criterion.

563. The system of claim 562, wherein the processor issues further instructions to:

retrieve user profile and social graph preferences; and

utilize the retrieved user profile and social graph preferences to create socially influenced ranking categories for obtaining the ranked list of universally resolvable content items.

564. The system of claim 562, wherein the socially influenced content item seed selection criterion is one of a: (i) a specified default, (ii) currently played track, (iii) most played track, (iv) favorite track, (v) favorite genre, and (vi) last purchase.

565. The system of claim 558, wherein the results from the query are assigned a weight corresponding to relevance to the content query.

566. The system of claim 565, wherein the instructions to obtain the ranked list of universally resolvable content item further comprises instructions to:

assign a category weight to each one of the socially influenced ranking categories; and

rank the socially influenced categorized results based on a calculated social influence score.

567. The system of claim 566, wherein for each one of the unique results, the processor issues further instructions to calculate the social influence score based on the assigned category weight and the weight corresponding to relevance to the content query.

568. The system of claim 556, wherein the processor issues further instructions to:

obtain from the user's client device a local cache request for a non-local universally resolvable content item; and

provide the non-local universally resolvable content item to the user's client device.

569. The system of claim 568, wherein the non-local universally resolvable content item in the user's client device is marked as temporary.

570. The system of claim 556, wherein the processor issues further instructions to:

determine via the processor interest graph influenced content attributes associated with the universally resolvable content seed;

query the universally resolvable content database using the interest graph influenced content attributes;

obtain a ranked list of universally resolvable content items from the querying;

provide the ranked list of universally resolvable content items to the user.

571. A processor-readable medium storing processor-issuable instructions for providing universally resolvable content items, wherein the processor issues instructions to:

receive user selection of a universally resolvable content seed;

determine via a processor socially influenced content attributes associated with the universally resolvable content seed;

query a universally resolvable content database using the socially influenced content attributes;

obtain a ranked list of universally resolvable content items from the querying; and

provide the ranked list of universally resolvable content items to the user.

572. The medium of claim 571, wherein the processor issues further instructions to:

create a content query based on the socially influenced content attributes for the querying.

573. The medium of claim 572, wherein the processor issues further instructions to:

create socially influenced ranking categories and populating the ranking categories with results from the query to obtain the ranked list of universally resolvable content items.

574. The medium of claim 571, wherein the instructions to determine the socially influenced content attributes associated with the universally resolvable content seed includes instructions to:

determine if the universally resolvable content seed is a universally resolvable content item seed.

575. The medium of claim 574, wherein when the universally resolvable content seed is a universally resolvable content item seed, the instructions to determine the socially influenced content attributes includes instructions to:

retrieve user profile and social graph preferences;

utilize the retrieved user profile and social graph preferences to create socially influenced ranking categories to obtain the ranked list of universally resolvable content items.

576. The medium of claim 575, wherein the social graph preferences are derived from the user's one or more social networks.

577. The medium of claim 574, wherein when the universally resolvable content seed is not a content item seed, the instructions to determine the socially influenced content attributes further comprises instructions to:

select a socially influenced content item seed selection criterion; and

retrieve a universally resolvable content item seed associated with the universally resolvable content seed based on the selected criterion.

578. The medium of claim 577, wherein the processor issues further instructions to:

retrieve user profile and social graph preferences; and

utilize the retrieved user profile and social graph preferences to create socially influenced ranking categories for obtaining the ranked list of universally resolvable content items.

579. The medium of claim 577, wherein the socially influenced content item seed selection criterion is one of a: (i) a specified default, (ii) currently played track, (iii) most played track, (iv) favorite track, (v) favorite genre, and (vi) last purchase.

580. The medium of claim 573, wherein the results from the query are assigned a weight corresponding to relevance to the content query.

581. The medium of claim 580, wherein the instructions to obtain the ranked list of universally resolvable content item further comprises instructions to:

assign a category weight to each one of the socially influenced ranking categories; and

rank the socially influenced categorized results based on a calculated social influence score.

582. The medium of claim 581, wherein for each one of the unique results, the processor issues further instructions to calculate the social influence score based on the assigned category weight and the weight corresponding to relevance to the content query.

583. The medium of claim 571, wherein the processor issues further instructions to:

obtain from the user's client device a local cache request for a non-local universally resolvable content item; and

provide the non-local universally resolvable content item to the user's client device.

584. The medium of claim 583, wherein the non-local universally resolvable content item in the user's client device is marked as temporary.

585. The medium of claim 571, wherein the processor issues further instructions to:

determine via the processor interest graph influenced content attributes associated with the universally resolvable content seed;

query the universally resolvable content database using the interest graph influenced content attributes;

obtain a ranked list of universally resolvable content items from the querying;

provide the ranked list of universally resolvable content items to the user.

586. An apparatus for providing universally resolvable content items, comprising:

a memory;

a processor disposed in communication with said memory, and configured to issue a plurality of processing instructions stored in the memory, wherein the processor issues instructions to:

receive user selection of a universally resolvable content seed;

determine via a processor socially influenced content attributes associated with the universally resolvable content seed;

query a universally resolvable content database using the socially influenced content attributes;

obtain a ranked list of universally resolvable content items from the querying; and

provide the ranked list of universally resolvable content items to the user.

587. The apparatus of claim 586, wherein the processor issues further instructions to:

create a content query based on the socially influenced content attributes for the querying.

588. The apparatus of claim 587, wherein the processor issues further instructions to:

create socially influenced ranking categories and populating the ranking categories with results from the query to obtain the ranked list of universally resolvable content items.

589. The apparatus of claim 586, wherein the instructions to determine the socially influenced content attributes associated with the universally resolvable content seed includes instructions to:

determine if the universally resolvable content seed is a universally resolvable content item seed.

590. The apparatus of claim 589, wherein when the universally resolvable content seed is a universally resolvable content item seed, the instructions to determine the socially influenced content attributes includes instructions to:

retrieve user profile and social graph preferences;

utilize the retrieved user profile and social graph preferences to create socially influenced ranking categories to obtain the ranked list of universally resolvable content items.

591. The apparatus of claim 590, wherein the social graph preferences are derived from the user's one or more social networks.

592. The apparatus of claim 589, wherein when the universally resolvable content seed is not a content item seed, the instructions to determine the socially influenced content attributes further comprises instructions to:

select a socially influenced content item seed selection criterion; and

retrieve a universally resolvable content item seed associated with the universally resolvable content seed based on the selected criterion.

593. The apparatus of claim 592, wherein the processor issues further instructions to:

retrieve user profile and social graph preferences; and

utilize the retrieved user profile and social graph preferences to create socially influenced ranking categories for obtaining the ranked list of universally resolvable content items.

594. The apparatus of claim 592, wherein the socially influenced content item seed selection criterion is one of a: (i) a specified default, (ii) currently played track, (iii) most played track, (iv) favorite track, (v) favorite genre, and (vi) last purchase.

595. The apparatus of claim 588, wherein the results from the query are assigned a weight corresponding to relevance to the content query.

596. The apparatus of claim 595, wherein the instructions to obtain the ranked list of universally resolvable content item further comprises instructions to:

assign a category weight to each one of the socially influenced ranking categories; and

rank the socially influenced categorized results based on a calculated social influence score.

597. The apparatus of claim 596, wherein for each one of the unique results, the processor issues further instructions to calculate the social influence score based on the assigned category weight and the weight corresponding to relevance to the content query.

598. The apparatus of claim 586, wherein the processor issues further instructions to:

obtain from the user's client device a local cache request for a non-local universally resolvable content item; and

provide the non-local universally resolvable content item to the user's client device.

599. The apparatus of claim 598, wherein the non-local universally resolvable content item in the user's client device is marked as temporary.

600. The apparatus of claim 586, wherein the processor issues further instructions to:

determine via the processor interest graph influenced content attributes associated with the universally resolvable content seed;

query the universally resolvable content database using the interest graph influenced content attributes;

obtain a ranked list of universally resolvable content items from the querying;

provide the ranked list of universally resolvable content items to the user.

601. A processor-implemented method for providing universally resolvable content items, comprising:

providing user selection of a universally resolvable content seed;

providing a request to determine via a processor socially influenced content attributes associated with the universally resolvable content seed;

providing a request to querying a universally resolvable content database using the socially influenced content attributes;

providing a request obtaining a ranked list of universally resolvable content items from the querying;

receiving the ranked list of universally resolvable content items to the user.

602. The method of claim 601, further comprising:

creating a content query based on the socially influenced content attributes for the querying.

603. The method of claim 602, further comprising:

providing authorization to create socially influenced ranking categories and populating the ranking categories with results from the query to obtain the ranked list of universally resolvable content items.

604. The method of claim 601, wherein determining the socially influenced content attributes associated with the universally resolvable content seed includes:

providing authorization to determine if the universally resolvable content seed is a universally resolvable content item seed.

605. The method of claim 604, wherein when the universally resolvable content seed is a universally resolvable content item seed, determining the socially influenced content attributes includes:

retrieving user profile and social graph preferences;

utilizing the retrieved user profile and social graph preferences to create socially influenced ranking categories to obtain the ranked list of universally resolvable content items.

606. The method of claim 605, wherein the social graph preferences are derived from the user's one or more social networks.

607. The method of claim 604, wherein when the universally resolvable content seed is not a content item seed, determining the socially influenced content attributes further comprises:

selecting a socially influenced content item seed selection criterion; and

retrieving a universally resolvable content item seed associated with the universally resolvable content seed based on the selected criterion.

608. The method of claim 607, further comprising:

providing user profile and social graph preferences; and

providing authorization to utilize the retrieved user profile and social graph preferences to create socially influenced ranking categories for obtaining the ranked list of universally resolvable content items.

609. The method of claim 607, wherein the socially influenced content item seed selection criterion is one of a: (i) a specified default, (ii) currently played track, (iii) most played track, (iv) favorite track, (v) favorite genre, and (vi) last purchase.

610. The method of claim 603, wherein the results from the query are assigned a weight corresponding to relevance to the content query.

611. The method of claim 610, wherein obtaining the ranked list of universally resolvable content item further comprises:

assigning a category weight to each one of the socially influenced ranking categories; and

ranking the socially influenced categorized results based on a calculated social influence score.

612. The method of claim 611, further comprising:

for each one of the unique results, calculating the social influence score based on the assigned category weight and the weight corresponding to relevance to the content query.

613. The method of claim 601, further comprising:

obtaining from the user's client device a local cache request for a non-local universally resolvable content item; and

providing the non-local universally resolvable content item to the user's client device.

614. The method of claim 611, wherein the non-local universally resolvable content item in the user's client device is marked as temporary.

615. The method of claim 601, further comprising:

providing authorization to determine via the processor interest graph influenced content attributes associated with the universally resolvable content seed;

providing authorization to query the universally resolvable content database using the interest graph influenced content attributes;

providing a ranked list of universally resolvable content items from the querying;

obtaining the ranked list of universally resolvable content items to the user.

616. A system for providing universally resolvable content items, comprising:

a memory;

a processor disposed in communication with said memory, and configured to issue a plurality of processing instructions stored in the memory, wherein the processor issues instructions to:

provide user selection of a universally resolvable content seed;

provide a request to determine via a processor socially influenced content attributes associated with the universally resolvable content seed;

provide a request to query a universally resolvable content database using the socially influenced content attributes;

provide a request to obtain a ranked list of universally resolvable content items from the querying; and

obtain the ranked list of universally resolvable content items to the user.

617. The system of claim 616, wherein the processor issues further instructions to:

create a content query based on the socially influenced content attributes for the querying.

618. The system of claim 617, wherein the processor issues further instructions to:

create socially influenced ranking categories and populating the ranking categories with results from the query to obtain the ranked list of universally resolvable content items.

619. The system of claim 616, wherein the instructions to determine the socially influenced content attributes associated with the universally resolvable content seed includes instructions to:

determine if the universally resolvable content seed is a universally resolvable content item seed.

620. The system of claim 619, wherein when the universally resolvable content seed is a universally resolvable content item seed, the instructions to determine the socially influenced content attributes includes instructions to:

retrieve user profile and social graph preferences;

utilize the retrieved user profile and social graph preferences to create socially influenced ranking categories to obtain the ranked list of universally resolvable content items.

621. The system of claim 620, wherein the social graph preferences are derived from the user's one or more social networks.

622. The system of claim 619, wherein when the universally resolvable content seed is not a content item seed, the instructions to determine the socially influenced content attributes further comprises instructions to:

select a socially influenced content item seed selection criterion; and

retrieve a universally resolvable content item seed associated with the universally resolvable content seed based on the selected criterion.

623. The system of claim 622, wherein the processor issues further instructions to:

retrieve user profile and social graph preferences; and

utilize the retrieved user profile and social graph preferences to create socially influenced ranking categories for obtaining the ranked list of universally resolvable content items.

624. The system of claim 622, wherein the socially influenced content item seed selection criterion is one of a: (i) a specified default, (ii) currently played track, (iii) most played track, (iv) favorite track, (v) favorite genre, and (vi) last purchase.

625. The system of claim 618, wherein the results from the query are assigned a weight corresponding to relevance to the content query.

626. The system of claim 625, wherein the instructions to obtain the ranked list of universally resolvable content item further comprises instructions to:

assign a category weight to each one of the socially influenced ranking categories; and

rank the socially influenced categorized results based on a calculated social influence score.

627. The system of claim 626, wherein for each one of the unique results, the processor issues further instructions to calculate the social influence score based on the assigned category weight and the weight corresponding to relevance to the content query.

628. The system of claim 616, wherein the processor issues further instructions to:

obtain from the user's client device a local cache request for a non-local universally resolvable content item; and

provide the non-local universally resolvable content item to the user's client device.

629. The system of claim 628, wherein the non-local universally resolvable content item in the user's client device is marked as temporary.

630. The system of claim 616, wherein the processor issues further instructions to:

provide a request to determine via the processor interest graph influenced content attributes associated with the universally resolvable content seed;

provide a request to query the universally resolvable content database using the interest graph influenced content attributes;

provide a request to obtain a ranked list of universally resolvable content items from the querying;

obtain the ranked list of universally resolvable content items to the user.

631. A processor-readable medium storing processor-issuable instructions for providing universally resolvable content items, wherein the processor issues instructions to:

provide user selection of a universally resolvable content seed;

provide a request to determine via a processor socially influenced content attributes associated with the universally resolvable content seed;

provide a request to query a universally resolvable content database using the socially influenced content attributes;

provide a request to obtain a ranked list of universally resolvable content items from the querying; and

obtain the ranked list of universally resolvable content items to the user.

632. The medium of claim 631, wherein the processor issues further instructions to:

create a content query based on the socially influenced content attributes for the querying.

633. The medium of claim 632, wherein the processor issues further instructions to:

create socially influenced ranking categories and populating the ranking categories with results from the query to obtain the ranked list of universally resolvable content items.

634. The medium of claim 631, wherein the instructions to determine the socially influenced content attributes associated with the universally resolvable content seed includes instructions to:

determine if the universally resolvable content seed is a universally resolvable content item seed.

635. The medium of claim 634, wherein when the universally resolvable content seed is a universally resolvable content item seed, the instructions to determine the socially influenced content attributes includes instructions to:

retrieve user profile and social graph preferences;

utilize the retrieved user profile and social graph preferences to create socially influenced ranking categories to obtain the ranked list of universally resolvable content items.

636. The medium of claim 635, wherein the social graph preferences are derived from the user's one or more social networks.

637. The medium of claim 634, wherein when the universally resolvable content seed is not a content item seed, the instructions to determine the socially influenced content attributes further comprises instructions to:

select a socially influenced content item seed selection criterion; and

retrieve a universally resolvable content item seed associated with the universally resolvable content seed based on the selected criterion.

638. The medium of claim 637, wherein the processor issues further instructions to:

retrieve user profile and social graph preferences; and

utilize the retrieved user profile and social graph preferences to create socially influenced ranking categories for obtaining the ranked list of universally resolvable content items.

639. The medium of claim 637, wherein the socially influenced content item seed selection criterion is one of a: (i) a specified default, (ii) currently played track, (iii) most played track, (iv) favorite track, (v) favorite genre, and (vi) last purchase.

640. The medium of claim 633, wherein the results from the query are assigned a weight corresponding to relevance to the content query.

641. The medium of claim 640, wherein the instructions to obtain the ranked list of universally resolvable content item further comprises instructions to:

assign a category weight to each one of the socially influenced ranking categories; and

rank the socially influenced categorized results based on a calculated social influence score.

642. The medium of claim 641, wherein for each one of the unique results, the processor issues further instructions to calculate the social influence score based on the assigned category weight and the weight corresponding to relevance to the content query.

643. The medium of claim 631, wherein the processor issues further instructions to:

obtain from the user's client device a local cache request for a non-local universally resolvable content item; and

provide the non-local universally resolvable content item to the user's client device.

644. The medium of claim 643, wherein the non-local universally resolvable content item in the user's client device is marked as temporary.

645. The medium of claim 631, wherein the processor issues further instructions to:

provide a request to determine via the processor interest graph influenced content attributes associated with the universally resolvable content seed;

provide a request to query the universally resolvable content database using the interest graph influenced content attributes;

provide a request to obtain a ranked list of universally resolvable content items from the querying;

obtain the ranked list of universally resolvable content items to the user.

646. An apparatus for providing universally resolvable content items, comprising:

a memory;

a processor disposed in communication with said memory, and configured to issue a plurality of processing instructions stored in the memory, wherein the processor issues instructions to:

provide user selection of a universally resolvable content seed;

provide a request to determine via a processor socially influenced content attributes associated with the universally resolvable content seed;

provide a request to query a universally resolvable content database using the socially influenced content attributes;

provide a request to obtain a ranked list of universally resolvable content items from the querying; and

obtain the ranked list of universally resolvable content items to the user.

647. The apparatus of claim 646, wherein the processor issues further instructions to:

create a content query based on the socially influenced content attributes for the querying.

648. The apparatus of claim 647, wherein the processor issues further instructions to:

create socially influenced ranking categories and populating the ranking categories with results from the query to obtain the ranked list of universally resolvable content items.

649. The apparatus of claim 646, wherein the instructions to determine the socially influenced content attributes associated with the universally resolvable content seed includes instructions to:

determine if the universally resolvable content seed is a universally resolvable content item seed.

650. The apparatus of claim 649, wherein when the universally resolvable content seed is a universally resolvable content item seed, the instructions to determine the socially influenced content attributes includes instructions to:

retrieve user profile and social graph preferences;

utilize the retrieved user profile and social graph preferences to create socially influenced ranking categories to obtain the ranked list of universally resolvable content items.

651. The apparatus of claim 650, wherein the social graph preferences are derived from the user's one or more social networks.

652. The apparatus of claim 649, wherein when the universally resolvable content seed is not a content item seed, the instructions to determine the socially influenced content attributes further comprises instructions to:

select a socially influenced content item seed selection criterion; and

retrieve a universally resolvable content item seed associated with the universally resolvable content seed based on the selected criterion.

653. The apparatus of claim 652, wherein the processor issues further instructions to:

retrieve user profile and social graph preferences; and

utilize the retrieved user profile and social graph preferences to create socially influenced ranking categories for obtaining the ranked list of universally resolvable content items.

654. The apparatus of claim 652, wherein the socially influenced content item seed selection criterion is one of a: (i) a specified default, (ii) currently played track, (iii) most played track, (iv) favorite track, (v) favorite genre, and (vi) last purchase.

655. The apparatus of claim 648, wherein the results from the query are assigned a weight corresponding to relevance to the content query.

656. The apparatus of claim 655, wherein the instructions to obtain the ranked list of universally resolvable content item further comprises instructions to:

assign a category weight to each one of the socially influenced ranking categories; and

rank the socially influenced categorized results based on a calculated social influence score.

657. The apparatus of claim 656, wherein for each one of the unique results, the processor issues further instructions to calculate the social influence score based on the assigned category weight and the weight corresponding to relevance to the content query.

658. The apparatus of claim 646, wherein the processor issues further instructions to:

obtain from the user's client device a local cache request for a non-local universally resolvable content item; and

provide the non-local universally resolvable content item to the user's client device.

659. The apparatus of claim 658, wherein the non-local universally resolvable content item in the user's client device is marked as temporary.

660. The apparatus of claim 646, wherein the processor issues further instructions to:

provide a request to determine via the processor interest graph influenced content attributes associated with the universally resolvable content seed;

provide a request to query the universally resolvable content database using the interest graph influenced content attributes;

provide a request to obtain a ranked list of universally resolvable content items from the querying;

obtain the ranked list of universally resolvable content items to the user.

661. A processor-implemented method, comprising:

obtaining information relating to universally resolvable media content ("URMC") social influence weighted user engagement in at least one URMC socially influencing activity;

obtaining the user's social influence weight in a universally resolvable media content service;

obtaining a social influence weight associated with the activity; and

updating the user's social influence profile based on the activity.

662. The method of claim 661, further comprising:

prior to the updating, determining whether the activity meets the social influence weight upgrade criteria.

663. The method of claim 661, wherein updating the user's social influence profile based on the activity further comprises:

obtaining social influence points associated with the activity; and

determine the social influence weight corresponding to the social influence points.

664. The method of claim 663, further comprising:

obtaining historical data corresponding to the user engagement in the activity; and

adjusting the social influence points based on the historical data.

665. The method of claim 661, wherein the activity is at least one of: (i) playlist creation; (ii) playlist sharing; (iii) media content rating; (iv) messaging; (v) posting; and (vi) influencing a number of users to play, download or purchase one or more tracks.

666. The method of claim 661, further comprising:

qualifying the user for at least one promotional incentive based on the updated social influence profile.

667. The method of claim 666, wherein the at least one promotional incentive is one: (i) purchase discount; (ii) free merchandise; and (iii) admission to events.

668. The method of claim 666, further comprising:

providing the user the at least one promotional incentive when the activity matches one or more activity criteria.

669. The method of claim 661, wherein the socially influencing activity is related to at least one of: a social graph and an interest graph.

670. The method of claim 665, further comprising:

determining whether the activity is a URMC socially influencing activity.

671. The method of claim 670, wherein the determining is based on tracked frequency of user engagement with a playlist sharing activity.

672. The method of claim 670, wherein the determining is based on tracked license purchase attributable to the user.

673. The method of claim 670, wherein the determining is based on tracked number of users following and unfollowing the user.

674. The method of claim 670, wherein the determining is based on tracked response to content sharing.

675. The method of claim 670, wherein the determining is based on tracked usage volume of other users attributable to the user.

676. A system, comprising:

a memory;

a processor disposed in communication with said memory, and configured to issue a plurality of processing instructions stored in the memory, wherein the processor issues instructions to:

obtain information relating to universally resolvable media content ("URMC") social influence weighted user engagement in at least one URMC socially influencing activity;

obtain the user's social influence weight in a universally resolvable media content service;

obtain a social influence weight associated with the activity; and

update the user's social influence profile based on the activity.

677. The system of claim 676, wherein the processor issues further instructions to:

prior to the update, determine whether the activity meets the social influence weight upgrade criteria.

678. The system of claim 676, wherein the instructions to update the user's social influence profile based on the activity further comprises instructions to:

obtain social influence points associated with the activity; and

determine the social influence weight corresponding to the social influence points.

679. The system of claim 678, wherein the processor issues further instructions to: obtain historical data corresponding to the user engagement in the activity; and

adjust the social influence points based on the historical data.

680. The system of claim 676, wherein the activity is at least one of: (i) playlist creation; (ii) playlist sharing; (iii) media content rating; (iv) messaging; (v) posting; and (vi) influencing a number of users to play, download or purchase one or more tracks.

681. The system of claim 676, wherein the processor issues further instructions to:

qualify the user for at least one promotional incentive based on the updated social influence profile.

682. The system of claim 681, wherein the at least one promotional incentive is one: (i) purchase discount; (ii) free merchandise; and (iii) admission to events.

683. The system of claim 681, wherein the processor issues further instructions to:

provide the user the at least one promotional incentive when the activity matches one or more activity criteria.

684. The system of claim 676, wherein the socially influencing activity is related to at least one of: a social graph and an interest graph.

685. The system of claim 680, wherein the processor issues further instructions to:

determine whether the activity is a URMC socially influencing activity.

686. The system of claim 685, wherein the determination is based on tracked frequency of user engagement with a playlist sharing activity.

687. The system of claim 685, wherein the determination is based on tracked license purchase attributable to the user.

688. The system of claim 685, wherein the determination is based on tracked number of users following and unfollowing the user.

689. The system of claim 685, wherein the determination is based on tracked response to content sharing.

690. The system of claim 685, wherein the determination is based on tracked usage volume of other users attributable to the user.

691. A processor-readable medium storing processor-issuable instructions, wherein the processor issues instructions to:

obtain information relating to universally resolvable media content ("URMC") social influence weighted user engagement in at least one URMC socially influencing activity;

obtain the user's social influence weight in a universally resolvable media content service;

obtain a social influence weight associated with the activity; and

update the user's social influence profile based on the activity.

692. The medium of claim 691, wherein the processor issues further instructions to:

prior to the update, determine whether the activity meets the social influence weight upgrade criteria.

693. The medium of claim 691, wherein the instructions to update the user's social influence profile based on the activity further comprises instructions to:

obtain social influence points associated with the activity; and

determine the social influence weight corresponding to the social influence points.

694. The medium of claim 693, wherein the processor issues further instructions to: obtain historical data corresponding to the user engagement in the activity; and

adjust the social influence points based on the historical data.

695. The medium of claim 691, wherein the activity is at least one of: (i) playlist creation; (ii) playlist sharing; (iii) media content rating; (iv) messaging; (v) posting; and (vi) influencing a number of users to play, download or purchase one or more tracks.

696. The medium of claim 691, wherein the processor issues further instructions to:

qualify the user for at least one promotional incentive based on the updated social influence profile.

697. The medium of claim 696, wherein the at least one promotional incentive is one: (i) purchase discount; (ii) free merchandise; and (iii) admission to events.

698. The medium of claim 696, wherein the processor issues further instructions to:

provide the user the at least one promotional incentive when the activity matches one or more activity criteria.

699. The medium of claim 691, wherein the socially influencing activity is related to at least one of: a social graph and an interest graph.

700. The medium of claim 695 wherein the processor issues further instructions to:

determine whether the activity is a URMC socially influencing activity.

701. The medium of claim 700, wherein the determination is based on tracked frequency of user engagement with a playlist sharing activity.

702. The medium of claim 700, wherein the determination is based on tracked license purchase attributable to the user.

703. The medium of claim 700, wherein the determination is based on tracked number of users following and unfollowing the user.

704. The medium of claim 700, wherein the determination is based on tracked response to content sharing.

705. The medium of claim 700, wherein the determination is based on tracked usage volume of other users attributable to the user.

706. An apparatus, comprising:

a memory;

a processor disposed in communication with said memory, and configured to issue a plurality of processing instructions stored in the memory, wherein the processor issues instructions to:

obtain information relating to universally resolvable media content ("URMC") social influence weighted user engagement in at least one URMC socially influencing activity;

obtain the user's social influence weight in a universally resolvable media content service;

obtain a social influence weight associated with the activity; and

update the user's social influence profile based on the activity.

707. The apparatus of claim 706, wherein the processor issues further instructions to:

prior to the update, determine whether the activity meets the social influence weight upgrade criteria.

708. The apparatus of claim 706, wherein the instructions to update the user's social influence profile based on the activity further comprises instructions to:

obtain social influence points associated with the activity; and

determine the social influence weight corresponding to the social influence points.

709. The apparatus of claim 708, wherein the processor issues further instructions to: obtain historical data corresponding to the user engagement in the activity; and

adjust the social influence points based on the historical data.

710. The apparatus of claim 706, wherein the activity is at least one of: (i) playlist creation; (ii) playlist sharing; (iii) media content rating; (iv) messaging; (v) posting; and (vi) influencing a number of users to play, download or purchase one or more tracks.

711. The apparatus of claim 706, wherein the processor issues further instructions to:

qualify the user for at least one promotional incentive based on the updated social influence profile.

712. The apparatus of claim 711, wherein the at least one promotional incentive is one: (i) purchase discount; (ii) free merchandise; and (iii) admission to events.

713. The apparatus of claim 711, wherein the processor issues further instructions to:

provide the user the at least one promotional incentive when the activity matches one or more activity criteria.

714. The apparatus of claim 706, wherein the socially influencing activity is related to at least one of: a social graph and an interest graph.

715. The apparatus of claim 710 wherein the processor issues further instructions to:

determine whether the activity is a URMC socially influencing activity.

716. The apparatus of claim 715, wherein the determination is based on tracked frequency of user engagement with a playlist sharing activity.

717. The apparatus of claim 715, wherein the determination is based on tracked license purchase attributable to the user.

718. The apparatus of claim 715, wherein the determination is based on tracked number of users following and unfollowing the user.

719. The apparatus of claim 715, wherein the determination is based on tracked response to content sharing.

720. The apparatus of claim 715, wherein the determination is based on tracked usage volume of other users attributable to the user.

721. A processor-implemented method, comprising:

providing information relating to universally resolvable media content ("URMC") social influence weighted user engagement in at least one URMC socially influencing activity;

providing the user's social influence weight in a universally resolvable media content service;

providing a social influence weight associated with the activity; and

providing a request to update the user's social influence profile based on the activity.

722. The method of claim 721, further comprising:

prior to the updating, determining whether the activity meets the social influence weight upgrade criteria.

723. The method of claim 721, wherein updating the user's social influence profile based on the activity further comprises:

obtaining social influence points associated with the activity; and

determine the social influence weight corresponding to the social influence points.

724. The method of claim 723, further comprising:

obtaining historical data corresponding to the user engagement in the activity; and

adjusting the social influence points based on the historical data.

725. The method of claim 721, wherein the activity is at least one of: (i) playlist creation; (ii) playlist sharing; (iii) media content rating; (iv) messaging; (v) posting; and (vi) influencing a number of users to play, download or purchase one or more tracks.

726. The method of claim 721, further comprising:

qualifying the user for at least one promotional incentive based on the updated social influence profile.

727. The method of claim 726, wherein the at least one promotional incentive is one: (i) purchase discount; (ii) free merchandise; and (iii) admission to events.

728. The method of claim 726, further comprising:

providing the user the at least one promotional incentive when the activity matches one or more activity criteria.

729. The method of claim 721, wherein the socially influencing activity is related to at least one of: a social graph and an interest graph.

730. The method of claim 725, further comprising:

determining whether the activity is a URMC socially influencing activity.

731. The method of claim 730, wherein the determining is based on tracked frequency of user engagement with a playlist sharing activity.

732. The method of claim 730, wherein the determining is based on tracked license purchase attributable to the user.

733. The method of claim 730, wherein the determining is based on tracked number of users following and unfollowing the user.

734. The method of claim 730, wherein the determining is based on tracked response to content sharing.

735. The method of claim 730, wherein the determining is based on tracked usage volume of other users attributable to the user.

736. A system, comprising:

a memory;

a processor disposed in communication with said memory, and configured to issue a plurality of processing instructions stored in the memory, wherein the processor issues instructions to:

provide information relating to universally resolvable media content ("URMC") social influence weighted user engagement in at least one URMC socially influencing activity;

provide the user's social influence weight in a universally resolvable media content service;

provide a social influence weight associated with the activity; and

providing a request to update the user's social influence profile based on the activity.

737. The system of claim 736, wherein the processor issues further instructions to:

prior to the update, determine whether the activity meets the social influence weight upgrade criteria.

738. The system of claim 736, wherein the instructions to update the user's social influence profile based on the activity further comprises instructions to:

obtain social influence points associated with the activity; and

determine the social influence weight corresponding to the social influence points.

739. The system of claim 738, wherein the processor issues further instructions to: obtain historical data corresponding to the user engagement in the activity; and

adjust the social influence points based on the historical data.

740. The system of claim 736, wherein the activity is at least one of: (i) playlist creation; (ii) playlist sharing; (iii) media content rating; (iv) messaging; (v) posting; and (vi) influencing a number of users to play, download or purchase one or more tracks.

741. The system of claim 736, wherein the processor issues further instructions to:

qualify the user for at least one promotional incentive based on the updated social influence profile.

742. The system of claim 741, wherein the at least one promotional incentive is one: (i) purchase discount; (ii) free merchandise; and (iii) admission to events.

743. The system of claim 741, wherein the processor issues further instructions to:

provide the user the at least one promotional incentive when the activity matches one or more activity criteria.

744. The system of claim 736, wherein the socially influencing activity is related to at least one of: a social graph and an interest graph.

745. The system of claim 740, wherein the processor issues further instructions to:

determine whether the activity is a URMC socially influencing activity.

746. The system of claim 745, wherein the determination is based on tracked frequency of user engagement with a playlist sharing activity.

747. The system of claim 745, wherein the determination is based on tracked license purchase attributable to the user.

748. The system of claim 745, wherein the determination is based on tracked number of users following and unfollowing the user.

749. The system of claim 745, wherein the determination is based on tracked response to content sharing.

750. The system of claim 745, wherein the determination is based on tracked usage volume of other users attributable to the user.

751. A processor-readable medium storing processor-issuable instructions, wherein the processor issues instructions to:

provide information relating to universally resolvable media content ("URMC") social influence weighted user engagement in at least one URMC socially influencing activity;

provide the user's social influence weight in a universally resolvable media content service;

provide a social influence weight associated with the activity; and

providing a request to update the user's social influence profile based on the activity.

752. The medium of claim 751, wherein the processor issues further instructions to:

prior to the update, determine whether the activity meets the social influence weight upgrade criteria.

753. The medium of claim 751, wherein the instructions to update the user's social influence profile based on the activity further comprises instructions to:

obtain social influence points associated with the activity; and

determine the social influence weight corresponding to the social influence points.

754. The medium of claim 753, wherein the processor issues further instructions to: obtain historical data corresponding to the user engagement in the activity; and

adjust the social influence points based on the historical data.

755. The medium of claim 751, wherein the activity is at least one of: (i) playlist creation; (ii) playlist sharing; (iii) media content rating; (iv) messaging; (v) posting; and (vi) influencing a number of users to play, download or purchase one or more tracks.

756. The medium of claim 751, wherein the processor issues further instructions to:

qualify the user for at least one promotional incentive based on the updated social influence profile.

757. The medium of claim 756, wherein the at least one promotional incentive is one: (i) purchase discount; (ii) free merchandise; and (iii) admission to events.

758. The medium of claim 756, wherein the processor issues further instructions to:

provide the user the at least one promotional incentive when the activity matches one or more activity criteria.

759. The medium of claim 751, wherein the socially influencing activity is related to at least one of: a social graph and an interest graph.

760. The medium of claim 755 wherein the processor issues further instructions to:

determine whether the activity is a URMC socially influencing activity.

761. The medium of claim 760, wherein the determination is based on tracked frequency of user engagement with a playlist sharing activity.

762. The medium of claim 760, wherein the determination is based on tracked license purchase attributable to the user.

763. The medium of claim 760, wherein the determination is based on tracked number of users following and unfollowing the user.

764. The medium of claim 760, wherein the determination is based on tracked response to content sharing.

765. The medium of claim 760, wherein the determination is based on tracked usage volume of other users attributable to the user.

766. An apparatus, comprising:

a memory;

a processor disposed in communication with said memory, and configured to issue a plurality of processing instructions stored in the memory, wherein the processor issues instructions to:

obtain information relating to universally resolvable media content ("URMC") social influence weighted user engagement in at least one URMC socially influencing activity;

provide the user's social influence weight in a universally resolvable media content service;

provide a social influence weight associated with the activity; and

provide a request to update the user's social influence profile based on the activity.

767. The apparatus of claim 766, wherein the processor issues further instructions to:

prior to the update, determine whether the activity meets the social influence weight upgrade criteria.

768. The apparatus of claim 766, wherein the instructions to update the user's social influence profile based on the activity further comprises instructions to:

obtain social influence points associated with the activity; and

determine the social influence weight corresponding to the social influence points.

769. The apparatus of claim 768, wherein the processor issues further instructions to: obtain historical data corresponding to the user engagement in the activity; and

adjust the social influence points based on the historical data.

770. The apparatus of claim 766, wherein the activity is at least one of: (i) playlist creation; (ii) playlist sharing; (iii) media content rating; (iv) messaging; (v) posting; and (vi) influencing a number of users to play, download or purchase one or more tracks.

771. The apparatus of claim 766, wherein the processor issues further instructions to:

qualify the user for at least one promotional incentive based on the updated social influence profile.

772. The apparatus of claim 771, wherein the at least one promotional incentive is one: (i) purchase discount; (ii) free merchandise; and (iii) admission to events.

773. The apparatus of claim 771, wherein the processor issues further instructions to:

provide the user the at least one promotional incentive when the activity matches one or more activity criteria.

774. The apparatus of claim 766, wherein the socially influencing activity is related to at least one of: a social graph and an interest graph.

775. The apparatus of claim 770 wherein the processor issues further instructions to:

determine whether the activity is a URMC socially influencing activity.

776. The apparatus of claim 775, wherein the determination is based on tracked frequency of user engagement with a playlist sharing activity.

777. The apparatus of claim 775, wherein the determination is based on tracked license purchase attributable to the user.

778. The apparatus of claim 775, wherein the determination is based on tracked number of users following and unfollowing the user.

779. The apparatus of claim 775, wherein the determination is based on tracked response to content sharing.

780. The apparatus of claim 775, wherein the determination is based on tracked usage volume of other users attributable to the user.

781. A processor-implemented method, comprising:

detecting user initiation of a universally resolvable media content ("URMC") event in a client;

obtaining the URMC event identifying information;

recording the URMC event identifying information in association with the event in an event log in the client;

obtaining reporting frequency preference setting, wherein the preference setting includes at least one URMC user activity upload rule;

determining activation of a URMC upload threshold trigger by evaluating the at least one URMC user activity upload rule;

initiating reporting of the logged URMC event identifying information based on the trigger activation; and

updating the client upon successful acknowledgement of said reporting by a server.

782. The method of claim 781, further comprising:

anonymizing the URMC event identifying information in the event log before initiating said reporting.

783. The method of claim 782, wherein a decision for anonymizing the URMC event identifying information is based on user preference information.

784. The method of claim 781, wherein when the client is disconnected from a communication network:

suspending said reporting until the client is connected to the communication network.

785. The method of claim 784, wherein when said reporting is suspended and a user initiation of a URMC event is detected,:

determining, using at least one URMC upload threshold rule, whether to disable contents of the URMC collection in the client.

786. The method of claim 781, wherein the URMC event is one of: (1) content started; (ii) content paused; (iii) content stopped; (iv) content skipped; and (v) application closed.

787. The method of claim 781, wherein the URMC event identifying information includes play session information including: play session start time, play session end time, total play session time for each content item in at least one of user library section, community section, discovery section and magic playlist.

788. The method of claim 781, wherein the URMC event identifying information includes at least one of: (i) content event name; (ii) event time stamp; (iii) universally resolvable content identifier; and (iv) user information.

789. The method of claim 781, wherein the at least one URMC user activity upload rule specifies a time for initiating reporting.

790. The method of claim 781, wherein the at least one URMC user activity upload rule specifies a number of URMC events for initiating reporting.

791. The method of claim 781, wherein the at least one URMC user activity upload rule specifies a number of each type of URMC event for initiating reporting.

792. The method of claim 781, further comprising categorizing the URMC event as at least one of: (i) play event; (ii) import event; (iii) share event; (iv) community event; and (v) search event.

793. The method of claim 792, further comprising selecting one or more URMC event categories for reporting based on the user's enrollment status in guru program.

794. The method of claim 792, wherein the reported URMC event identifying information is used for determining influence points attributable to one or more URMC service users.

795. The method of claim 792, wherein the reported URMC event identifying information is used for determining recommendations for the user.

796. The method of claim 792, wherein the reported URMC event identifying information is used for determining license payouts to URMC service partners.

797. A system, comprising:

a memory;

a processor disposed in communication with said memory, and configured to issue a plurality of processing instructions stored in the memory, wherein the processor issues instructions to:

detect user initiation of a universally resolvable media content ("URMC") event in a client;

obtain the URMC event identifying information;

record the URMC event identifying information in association with the event in an event log in the client;

obtain reporting frequency preference setting, wherein the preference setting includes at least one URMC user activity upload rule;

determine activation of a URMC upload threshold trigger by evaluating the at least one URMC user activity upload rule;

initiate reporting of the logged URMC event identifying information based on the trigger activation; and

update the client upon successful acknowledgement of said reporting by a server.

798. The system of claim 797, further comprising instructions to:

anonymize the URMC event identifying information in the event log before initiating said reporting.

799. The system of claim 798, wherein a decision for anonymizing the URMC event identifying information is based on user preference information.

800. The system of claim 797, wherein when the client is disconnected from a communication network, providing instructions to:

suspend said reporting until the client is connected to the communication network.

801. The system of claim 800, wherein when said reporting is suspended and a user initiation of a URMC event is detected, providing instructions to:

determine, using at least one URMC upload threshold rule, whether to disable contents of the URMC collection in the client.

802. The system of claim 797, wherein the URMC event is one of: (1) content started; (ii) content paused; (iii) content stopped; (iv) content skipped; and (v) application closed.

803. The system of claim 797, wherein the URMC event identifying information includes play session information including: play session start time, play session end time, total play session time for each content item in at least one of user library section, community section, discovery section and magic playlist.

804. The system of claim 797, wherein the URMC event identifying information includes at least one of: (i) content event name; (ii) event time stamp; (iii) universally resolvable content identifier; and (iv) user information.

805. The system of claim 797, wherein the at least one URMC user activity upload rule specifies a time for initiating reporting.

806. The system of claim 797, wherein the at least one URMC user activity upload rule specifies a number of URMC events for initiating reporting.

807. The system of claim 797, wherein the at least one URMC user activity upload rule specifies a number of each type of URMC event for initiating reporting.

808. The system of claim 797, further comprising categorizing the URMC event as at least one of: (i) play event; (ii) import event; (iii) share event; (iv) community event; and (v) search event.

809. The system of claim 808, further comprising instructions to select one or more URMC event categories for reporting based on the user's enrollment status in guru program.

810. The system of claim 808, wherein the reported URMC event identifying information is used for determining influence points attributable to one or more URMC service users.

811. The system of claim 808, wherein the reported URMC event identifying information is used for determining recommendations for the user.

812. The system of claim 808, wherein the reported URMC event identifying information is used for determining license payouts to URMC service partners.

813. A processor-readable medium storing processor-issuable instructions, wherein the processor issues instructions to:

detect user initiation of a universally resolvable media content ("URMC") event in a client;

obtain the URMC event identifying information;

record the URMC event identifying information in association with the event in an event log in the client;

obtain reporting frequency preference setting, wherein the preference setting includes at least one URMC user activity upload rule;

determine activation of a URMC upload threshold trigger by evaluating the at least one URMC user activity upload rule;

initiate reporting of the logged URMC event identifying information based on the trigger activation; and

update the client upon successful acknowledgement of said reporting by a server.

814. The medium of claim 813, further comprising instructions to:

anonymize the URMC event identifying information in the event log before initiating said reporting.

815. The medium of claim 814, wherein a decision for anonymizing the URMC event identifying information is based on user preference information.

816. The medium of claim 813, wherein when the client is disconnected from a communication network, providing instructions to:

suspend said reporting until the client is connected to the communication network.

817. The medium of claim 816, wherein when said reporting is suspended and a user initiation of a URMC event is detected, providing instructions to:

determine, using at least one URMC upload threshold rule, whether to disable contents of the URMC collection in the client.

818. The medium of claim 813, wherein the URMC event is one of: (1) content started; (ii) content paused; (iii) content stopped; (iv) content skipped; and (v) application closed.

819. The medium of claim 813, wherein the URMC event identifying information includes play session information including: play session start time, play session end time, total play session time for each content item in at least one of user library section, community section, discovery section and magic playlist.

820. The medium of claim 813, wherein the URMC event identifying information includes at least one of: (i) content event name; (ii) event time stamp; (iii) universally resolvable content identifier; and (iv) user information.

821. The medium of claim 813, wherein the at least one URMC user activity upload rule specifies a time for initiating reporting.

822. The medium of claim 813, wherein the at least one URMC user activity upload rule specifies a number of URMC events for initiating reporting.

823. The medium of claim 813, wherein the at least one URMC user activity upload rule specifies a number of each type of URMC event for initiating reporting.

824. The medium of claim 813, further comprising categorizing the URMC event as at least one of: (i) play event; (ii) import event; (iii) share event; (iv) community event; and (v) search event.

825. The medium of claim 824, further comprising instructions to select one or more URMC event categories for reporting based on the user's enrollment status in guru program.

826. The medium of claim 824, wherein the reported URMC event identifying information is used for determining influence points attributable to one or more URMC service users.

827. The medium of claim 824, wherein the reported URMC event identifying information is used for determining recommendations for the user.

828. The medium of claim 824, wherein the reported URMC event identifying information is used for determining license payouts to URMC service partners.

829. An apparatus, comprising:

a memory;

a processor disposed in communication with said memory, and configured to issue a plurality of processing instructions stored in the memory, wherein the processor issues instructions to:

detect user initiation of a universally resolvable media content ("URMC") event in a client;

obtain the URMC event identifying information;

record the URMC event identifying information in association with the event in an event log in the client;

obtain reporting frequency preference setting, wherein the preference setting includes at least one URMC user activity upload rule;

determine activation of a URMC upload threshold trigger by evaluating the at least one URMC user activity upload rule;

initiate reporting of the logged URMC event identifying information based on the trigger activation; and

update the client upon successful acknowledgement of said reporting by a server.

830. The apparatus of claim 829, further comprising instructions to:

anonymize the URMC event identifying information in the event log before initiating said reporting.

831. The apparatus of claim 830, wherein a decision for anonymizing the URMC event identifying information is based on user preference information.

832. The apparatus of claim 829, wherein when the client is disconnected from a communication network, providing instructions to:

suspend said reporting until the client is connected to the communication network.

833. The apparatus of claim 832, wherein when said reporting is suspended and a user initiation of a URMC event is detected, providing instructions to:

determine, using at least one URMC upload threshold rule, whether to disable contents of the URMC collection in the client.

834. The apparatus of claim 829, wherein the URMC event is one of: (1) content started; (ii) content paused; (iii) content stopped; (iv) content skipped; and (v) application closed.

835. The apparatus of claim 829, wherein the URMC event identifying information includes play session information including: play session start time, play session end time, total play session time for each content item in at least one of user library section, community section, discovery section and magic playlist.

836. The apparatus of claim 829, wherein the URMC event identifying information includes at least one of: (i) content event name; (ii) event time stamp; (iii) universally resolvable content identifier; and (iv) user information.

837. The apparatus of claim 829, wherein the at least one URMC user activity upload rule specifies a time for initiating reporting.

838. The apparatus of claim 829, wherein the at least one URMC user activity upload rule specifies a number of URMC events for initiating reporting.

839. The apparatus of claim 829, wherein the at least one URMC user activity upload rule specifies a number of each type of URMC event for initiating reporting.

840. The apparatus of claim 829, further comprising categorizing the URMC event as at least one of: (i) play event; (ii) import event; (iii) share event; (iv) community event; and (v) search event.

841. The apparatus of claim 840, further comprising instructions to select one or more URMC event categories for reporting based on the user's enrollment status in guru program.

842. The apparatus of claim 840, wherein the reported URMC event identifying information is used for determining influence points attributable to one or more URMC service users.

843. The apparatus of claim 840, wherein the reported URMC event identifying information is used for determining recommendations for the user.

844. The apparatus of claim 840, wherein the reported URMC event identifying information is used for determining license payouts to URMC service partners.

845. A processor-implemented method, comprising:

obtaining notification of a user initiation of a universally resolvable media content ("URMC") event in a client;

obtaining an event log recording the URMC event identifying information in association with the event;

providing reporting frequency preference setting, wherein the preference setting includes at least one URMC user activity upload rule;

obtaining reporting of the logged URMC event identifying information that is triggered in accordance with at least one URMC user activity upload rule; and

providing an acknowledgment to the client upon obtaining said reporting.

846. A system, comprising:

a memory;

a processor disposed in communication with said memory, and configured to issue a plurality of processing instructions stored in the memory, wherein the processor issues instructions to:

obtain notification of a user initiation of a universally resolvable media content ("URMC") event in a client;

obtain an event log recording the URMC event identifying information in association with the event;

provide reporting frequency preference setting, wherein the preference setting includes at least one URMC user activity upload rule;

obtain reporting of the logged URMC event identifying information that is triggered in accordance with at least one URMC user activity upload rule; and

provide an acknowledgment to the client upon obtaining said reporting.

847. A processor-readable medium storing processor-issuable instructions, wherein the processor issues instructions to:

obtain notification of a user initiation of a universally resolvable media content ("URMC") event in a client;

obtain an event log recording the URMC event identifying information in association with the event;

provide reporting frequency preference setting, wherein the preference setting includes at least one URMC user activity upload rule;

obtain reporting of the logged URMC event identifying information that is triggered in accordance with at least one URMC user activity upload rule; and

provide an acknowledgment to the client upon obtaining said reporting.

848. An apparatus, comprising:

a memory;

a processor disposed in communication with said memory, and configured to issue a plurality of processing instructions stored in the memory, wherein the processor issues instructions to:

obtain notification of a user initiation of a universally resolvable media content ("URMC") event in a client;

obtain an event log recording the URMC event identifying information in association with the event;

provide reporting frequency preference setting, wherein the preference setting includes at least one URMC user activity upload rule;

obtain reporting of the logged URMC event identifying information that is triggered in accordance with at least one URMC user activity upload rule; and

provide an acknowledgment to the client upon obtaining said reporting.

849. A processor-implemented method, comprising:

identifying an unlicensed content item and uniquely resolving it within a universally resolvable media content ("URMC") service;

obtaining aggregate URMC service user engagement metric associated with the uniquely resolved content item during a predefined period of time;

obtaining an aggregate URMC service user engagement metric associated with a plurality of URMC items during the predefined period of time;

evaluating the obtained aggregate URMC service user engagement metrics using at least one URMC license request threshold rule;

identifying a target for a license request for the uniquely resolved content item; and

sending the license request to the identified target.

850. The method of claim 849, further comprising:

obtaining, from the target, a license authorizing addition of the uniquely resolved content item to the URMC catalog.

851. The method of claim 850, further comprising:

obtaining lossless original media file;

licensing, encrypting and encoding the obtained media file; and

making the encoded content media file available to users of the URMC service.

852. The method of claim 851, wherein the encoding includes a standard quality encoding and a mobile quality encoding.

853. The method of claim 849, wherein the license request includes at least the uniquely resolved content identifying information and a request to add the content item to the URMC collection.

854. The method of claim 849, wherein the URMC service user engagement metric is track play count.

855. The method of claim 849, wherein the URMC service user engagement metric is at least one of: (i) share count; (ii) download count; (iii) rating; and (iv) comment count.

856. The method of claim 855, wherein the URMC service user engagement metric is associated with at least one of: (i) a track; (ii) a playlist; (iii) a smart playlist; (iv) a shared playlist; (v) a magic playlist; and (vi) a shared library.

857. The method of claim 849, wherein the at least one URMC license request threshold rule specifies a trigger for the license request when the aggregate URMC service user engagement metric associated with the uniquely resolved content item is greater than a percent threshold of the aggregate URMC service user engagement metric associated with the plurality of URMC content items.

858. The method of claim 849, wherein the at least one URMC license request threshold rule specifies a threshold for the aggregate URMC service user engagement metrics associated with the uniquely resolved content item.

859. The method of claim 849, wherein identifying the unlicensed content item and uniquely resolving it within the URMC service further comprises acoustically matching the content item with URMC items in a URMC catalog.

860. The method of claim 849, wherein identifying the unlicensed content item and uniquely resolving it within the URMC service further comprises querying a URMC metadata database using metadata associated with the content item.

861. The method of claim 849, further comprising:

obtaining metadata associated with the uniquely resolved content item; and

querying a URMC license database using the obtained metadata for availability of license.

862. The method of claim 849, wherein the target for the license request is identified based on at least one of an acoustical fingerprint and metadata associated with the uniquely resolved content item.

863. The method of claim 849, wherein the identified target is a rights clearing agency.

864. The method of claim 849, wherein the identified target is one of participating licensors of the URMC service.

865. A system, comprising:

a memory;

a processor disposed in communication with said memory, and configured to issue a plurality of processing instructions stored in the memory, wherein the processor issues instructions to:

identify an unlicensed content item and uniquely resolving it within a universally resolvable media content ("URMC") service;

obtain aggregate URMC service user engagement metric associated with the uniquely resolved content item during a predefined period of time;

obtain an aggregate URMC service user engagement metric associated with a plurality of URMC items during the predefined period of time;

evaluate the obtained aggregate URMC service user engagement metrics using at least one URMC license request threshold rule;

identify a target for a license request for the uniquely resolved content item; and

send the license request to the identified target.

866. The system of claim 865, further comprising instructions to:

obtain, from the target, a license authorizing addition of the uniquely resolved content item to the URMC catalog.

867. The system of claim 866, further comprising instructions to:

obtain lossless original media file;

license, encrypting and encoding the obtained media file; and

make the encoded content media file available to users of the URMC service.

868. The system of claim 867, wherein the encoding includes a standard quality encoding and a mobile quality encoding.

869. The system of claim 865, wherein the license request includes at least the uniquely resolved content identifying information and a request to add the content item to the URMC collection.

870. The system of claim 865, wherein the URMC service user engagement metric is track play count.

871. The system of claim 865, wherein the URMC service user engagement metric is at least one of: (i) share count; (ii) download count; (iii) rating; and (iv) comment count.

872. The system of claim 871, wherein the URMC service user engagement metric is associated with at least one of: (i) a track; (ii) a playlist; (iii) a smart playlist; (iv) a shared playlist; (v) a magic playlist; and (vi) a shared library.

873. The system of claim 865, wherein the at least one URMC license request threshold rule specifies a trigger for the license request when the aggregate URMC service user engagement metric associated with the uniquely resolved content item is greater than a percent threshold of the aggregate URMC service user engagement metric associated with the plurality of URMC content items.

874. The system of claim 865, wherein the at least one URMC license request threshold rule specifies a threshold for the aggregate URMC service user engagement metrics associated with the uniquely resolved content item.

875. The system of claim 865, wherein identifying the unlicensed content item and uniquely resolving it within the URMC service further comprises acoustically matching the content item with URMC items in a URMC catalog.

876. The system of claim 865, wherein identifying the unlicensed content item and uniquely resolving it within the URMC service further comprises querying a URMC metadata database using metadata associated with the content item.

877. The system of claim 865, further comprising instructions to:

obtain metadata associated with the uniquely resolved content item; and

query a URMC license database using the obtained metadata for availability of license.

878. The system of claim 865, wherein the target for the license request is identified based on at least one of an acoustical fingerprint and metadata associated with the uniquely resolved content item.

879. The system of claim 865, wherein the identified target is a rights clearing agency.

880. The system of claim 865, wherein the identified target is one of participating licensors of the URMC service.

881. A processor-readable medium storing processor-issuable instructions, wherein the processor issues instructions to:

identify an unlicensed content item and uniquely resolving it within a universally resolvable media content ("URMC") service;

obtain aggregate URMC service user engagement metric associated with the uniquely resolved content item during a predefined period of time;

obtain an aggregate URMC service user engagement metric associated with a plurality of URMC items during the predefined period of time;

evaluate the obtained aggregate URMC service user engagement metrics using at least one URMC license request threshold rule;

identify a target for a license request for the uniquely resolved content item; and

send the license request to the identified target.

882. The medium of claim 881, further comprising instructions to:

obtain, from the target, a license authorizing addition of the uniquely resolved content item to the URMC catalog.

883. The medium of claim 882, further comprising instructions to:

obtain lossless original media file;

license, encrypting and encoding the obtained media file; and

make the encoded content media file available to users of the URMC service.

884. The medium of claim 883, wherein the encoding includes a standard quality encoding and a mobile quality encoding.

885. The medium of claim 881, wherein the license request includes at least the uniquely resolved content identifying information and a request to add the content item to the URMC collection.

886. The medium of claim 881, wherein the URMC service user engagement metric is track play count.

887. The medium of claim 881, wherein the URMC service user engagement metric is at least one of: (i) share count; (ii) download count; (iii) rating; and (iv) comment count.

888. The medium of claim 887, wherein the URMC service user engagement metric is associated with at least one of: (i) a track; (ii) a playlist; (iii) a smart playlist; (iv) a shared playlist; (v) a magic playlist; and (vi) a shared library.

889. The medium of claim 881, wherein the at least one URMC license request threshold rule specifies a trigger for the license request when the aggregate URMC service user engagement metric associated with the uniquely resolved content item is greater than a percent threshold of the aggregate URMC service user engagement metric associated with the plurality of URMC content items.

890. The medium of claim 881, wherein the at least one URMC license request threshold rule specifies a threshold for the aggregate URMC service user engagement metrics associated with the uniquely resolved content item.

891. The medium of claim 881, wherein identifying the unlicensed content item and uniquely resolving it within the URMC service further comprises acoustically matching the content item with URMC items in a URMC catalog.

892. The medium of claim 881, wherein identifying the unlicensed content item and uniquely resolving it within the URMC service further comprises querying a URMC metadata database using metadata associated with the content item.

893. The medium of claim 881, further comprising instructions to:

obtain metadata associated with the uniquely resolved content item; and

query a URMC license database using the obtained metadata for availability of license.

894. The medium of claim 881, wherein the target for the license request is identified based on at least one of an acoustical fingerprint and metadata associated with the uniquely resolved content item.

895. The medium of claim 881, wherein the identified target is a rights clearing agency.

896. The medium of claim 881, wherein the identified target is one of participating licensors of the URMC service.

897. An apparatus, comprising:

a memory;

a processor disposed in communication with said memory, and configured to issue a plurality of processing instructions stored in the memory, wherein the processor issues instructions to:

identify an unlicensed content item and uniquely resolving it within a universally resolvable media content ("URMC") service;

obtain aggregate URMC service user engagement metric associated with the uniquely resolved content item during a predefined period of time;

obtain an aggregate URMC service user engagement metric associated with a plurality of URMC items during the predefined period of time;

evaluate the obtained aggregate URMC service user engagement metrics using at least one URMC license request threshold rule;

identify a target for a license request for the uniquely resolved content item; and

send the license request to the identified target.

898. The apparatus of claim 897, further comprising instructions to:

obtain, from the target, a license authorizing addition of the uniquely resolved content item to the URMC catalog.

899. The apparatus of claim 898, further comprising instructions to:

obtain lossless original media file;

license, encrypting and encoding the obtained media file; and

make the encoded content media file available to users of the URMC service.

900. The apparatus of claim 899, wherein the encoding includes a standard quality encoding and a mobile quality encoding.

901. The apparatus of claim 897, wherein the license request includes at least the uniquely resolved content identifying information and a request to add the content item to the URMC collection.

902. The apparatus of claim 897, wherein the URMC service user engagement metric is track play count.

903. The apparatus of claim 897, wherein the URMC service user engagement metric is at least one of: (i) share count; (ii) download count; (iii) rating; and (iv) comment count.

904. The apparatus of claim 903, wherein the URMC service user engagement metric is associated with at least one of: (i) a track; (ii) a playlist; (iii) a smart playlist; (iv) a shared playlist; (v) a magic playlist; and (vi) a shared library.

905. The apparatus of claim 897, wherein the at least one URMC license request threshold rule specifies a trigger for the license request when the aggregate URMC service user engagement metric associated with the uniquely resolved content item is greater than a percent threshold of the aggregate URMC service user engagement metric associated with the plurality of URMC content items.

906. The apparatus of claim 897, wherein the at least one URMC license request threshold rule specifies a threshold for the aggregate URMC service user engagement metrics associated with the uniquely resolved content item.

907. The apparatus of claim 897, wherein identifying the unlicensed content item and uniquely resolving it within the URMC service further comprises acoustically matching the content item with URMC items in a URMC catalog.

908. The apparatus of claim 897, wherein identifying the unlicensed content item and uniquely resolving it within the URMC service further comprises querying a URMC metadata database using metadata associated with the content item.

909. The apparatus of claim 897, further comprising instructions to:

obtain metadata associated with the uniquely resolved content item; and

query a URMC license database using the obtained metadata for availability of license.

910. The apparatus of claim 897, wherein the target for the license request is identified based on at least one of an acoustical fingerprint and metadata associated with the uniquely resolved content item.

911. The apparatus of claim 897, wherein the identified target is a rights clearing agency.

912. The apparatus of claim 897, wherein the identified target is one of participating licensors of the URMC service.

913. A processor-implemented method, comprising:

providing an unlicensed content item for identification and uniquely resolving it within a universally resolvable media content ("URMC") service;

providing an indication to obtain aggregate URMC service user engagement metric associated with the uniquely resolved content item during a predefined period of time;

providing an indication to obtain an aggregate URMC service user engagement metric associated with a plurality of URMC items during the predefined period of time;

obtaining an indication of an evaluation of the aggregate URMC service user engagement metrics using at least one URMC license request threshold rule;

obtaining an identification of a target for a license request for the uniquely resolved content item; and

obtaining an indication of sending the license request to the identified target.

914. A system, comprising:

a memory;

a processor disposed in communication with said memory, and configured to issue a plurality of processing instructions stored in the memory, wherein the processor issues instructions to:

provide an unlicensed content item for identification and uniquely resolving it within a universally resolvable media content ("URMC") service;

provide an indication to obtain aggregate URMC service user engagement metric associated with the uniquely resolved content item during a predefined period of time;

provide an indication to obtain an aggregate URMC service user engagement metric associated with a plurality of URMC items during the predefined period of time;

obtain an indication of an evaluation of the aggregate URMC service user engagement metrics using at least one URMC license request threshold rule;

obtain an identification of a target for a license request for the uniquely resolved content item; and

obtain an indication of sending the license request to the identified target.

915. A processor-readable medium storing processor-issuable instructions, wherein the processor issues instructions to:

provide an unlicensed content item for identification and uniquely resolving it within a universally resolvable media content ("URMC") service;

provide an indication to obtain aggregate URMC service user engagement metric associated with the uniquely resolved content item during a predefined period of time;

provide an indication to obtain an aggregate URMC service user engagement metric associated with a plurality of URMC items during the predefined period of time;

obtain an indication of an evaluation of the aggregate URMC service user engagement metrics using at least one URMC license request threshold rule;

obtain an identification of a target for a license request for the uniquely resolved content item; and

obtain an indication of sending the license request to the identified target.

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916. An apparatus, comprising:

a memory;

a processor disposed in communication with said memory, and configured to issue a plurality of processing instructions stored in the memory, wherein the processor issues instructions to:

provide an unlicensed content item for identification and uniquely resolving it within a universally resolvable media content ("URMC") service;

provide an indication to obtain aggregate URMC service user engagement metric associated with the uniquely resolved content item during a predefined period of time;

provide an indication to obtain an aggregate URMC service user engagement metric associated with a plurality of URMC items during the predefined period of time;

obtain an indication of an evaluation of the aggregate URMC service user engagement metrics using at least one URMC license request threshold rule;

obtain an identification of a target for a license request for the uniquely resolved content item; and

obtain an indication of sending the license request to the identified target.

917. A processor-implemented method, comprising:

detecting a plurality of universally resolvable media content ("URMC") events initiated at a client;

obtaining URMC event identifying information for each detected URMC event;

determining if each detected URMC event is reportable based on the URMC event identifying information;

determining a reporting category for each reportable URMC event based on the URMC event identifying information;

recording each reportable URMC event and the associated reporting category in an event log in the client; and

initiating reporting of the logged URMC event identifying information.

918. The method of claim 917, further comprising:

obtaining reporting frequency preference setting, wherein the preference setting includes at least one URMC event reporting rule; and

initiating reporting of the logged URMC event identifying information based on the obtained reporting frequency preference setting.

919. The method of claim 918, further comprising updating the client upon successful acknowledgement of said reporting by a server.

920. The method of claim 917, wherein reportable events include at least one of: (i) play session time; (ii) playlist feature use; (iii) importing; (iv)sharing; (v) community; (vi) search; (vii) website; (viii) client; (ix) email; (x) marketing; (xi) user; and (xii) license and device.

921. The method of claim 920, wherein each reportable event is associated with a URMC service user identifier and a date and time stamp.

922. The method of claim 921, wherein determining if each detected URMC event is reportable based on the URMC event identifying information.

923. A system, comprising:

a memory;

a processor disposed in communication with said memory, and configured to issue a plurality of processing instructions stored in the memory, wherein the processor issues instructions to:

detect a plurality of universally resolvable media content ("URMC") events initiated at a client;

obtain URMC event identifying information for each detected URMC event;

determine if each detected URMC event is reportable based on the URMC event identifying information;

determine a reporting category for each reportable URMC event based on the URMC event identifying information;

record each reportable URMC event and the associated reporting category in an event log in the client; and

initiate reporting of the logged URMC event identifying information.

924. The system of claim 923, further comprising:

obtain reporting frequency preference setting, wherein the preference setting includes at least one URMC event reporting rule; and

initiate reporting of the logged URMC event identifying information based on the obtained reporting frequency preference setting.

925. The system of claim 924, further comprising updating the client upon successful acknowledgement of said reporting by a server.

926. The system of claim 923, wherein reportable events include at least one of: (i) play session time; (ii) playlist feature use; (iii) importing; (iv)sharing; (v) community; (vi) search; (vii) website; (viii) client; (ix) email; (x) marketing; (xi) user; and (xii) license and device.

927. The system of claim 926, wherein each reportable event is associated with a URMC service user identifier and a date and time stamp.

928. The system of claim 927, wherein determining if each detected URMC event is reportable based on the URMC event identifying information.

929. A processor-readable medium storing processor-issuable instructions, wherein the processor issues instructions to:

detect a plurality of universally resolvable media content ("URMC") events initiated at a client;

obtain URMC event identifying information for each detected URMC event;

determine if each detected URMC event is reportable based on the URMC event identifying information;

determine a reporting category for each reportable URMC event based on the URMC event identifying information;

record each reportable URMC event and the associated reporting category in an event log in the client; and

initiate reporting of the logged URMC event identifying information.

930. The medium of claim 929, further comprising:

obtain reporting frequency preference setting, wherein the preference setting includes at least one URMC event reporting rule; and

initiate reporting of the logged URMC event identifying information based on the obtained reporting frequency preference setting.

931. The medium of claim 930, further comprising updating the client upon successful acknowledgement of said reporting by a server.

932. The medium of claim 929, wherein reportable events include at least one of: (i) play session time; (ii) playlist feature use; (iii) importing; (iv)sharing; (v) community; (vi) search; (vii) website; (viii) client; (ix) email; (x) marketing; (xi) user; and (xii) license and device.

933. The medium of claim 932, wherein each reportable event is associated with a URMC service user identifier and a date and time stamp.

934. The medium of claim 933, wherein determining if each detected URMC event is reportable based on the URMC event identifying information.

935. An apparatus, comprising:

a memory;

a processor disposed in communication with said memory, and configured to issue a plurality of processing instructions stored in the memory, wherein the processor issues instructions to:

detect a plurality of universally resolvable media content ("URMC") events initiated at a client;

obtain URMC event identifying information for each detected URMC event;

determine if each detected URMC event is reportable based on the URMC event identifying information;

determine a reporting category for each reportable URMC event based on the URMC event identifying information;

record each reportable URMC event and the associated reporting category in an event log in the client; and

initiate reporting of the logged URMC event identifying information.

936. The apparatus of claim 935, further comprising:

obtain reporting frequency preference setting, wherein the preference setting includes at least one URMC event reporting rule; and

initiate reporting of the logged URMC event identifying information based on the obtained reporting frequency preference setting.

937. The apparatus of claim 936, further comprising updating the client upon successful acknowledgement of said reporting by a server.

938. The apparatus of claim 935, wherein reportable events include at least one of: (i) play session time; (ii) playlist feature use; (iii) importing; (iv)sharing; (v) community; (vi) search; (vii) website; (viii) client; (ix) email; (x) marketing; (xi) user; and (xii) license and device.

939. The apparatus of claim 938, wherein each reportable event is associated with a URMC service user identifier and a date and time stamp.

940. The apparatus of claim 939, wherein determining if each detected URMC event is reportable based on the URMC event identifying information.

941. A processor-implemented method, comprising:

providing a request to detect a plurality of universally resolvable media content ("URMC") events initiated at a client;

providing URMC event identifying information for each detected URMC event;

providing a request to determine if each detected URMC event is reportable based on the URMC event identifying information;

providing a request to determine a reporting category for each reportable URMC event based on the URMC event identifying information;

providing a request to record each reportable URMC event and the associated reporting category in an event log in the client; and

providing a request to initiate reporting of the logged URMC event identifying information.

942. A system, comprising:

a memory;

a processor disposed in communication with said memory, and configured to issue a plurality of processing instructions stored in the memory, wherein the processor issues instructions to:

provide a request to detect a plurality of universally resolvable media content ("URMC") events initiated at a client;

provide URMC event identifying information for each detected URMC event;

provide a request to determine if each detected URMC event is reportable based on the URMC event identifying information;

provide a request to determine a reporting category for each reportable URMC event based on the URMC event identifying information;

provide a request to record each reportable URMC event and the associated reporting category in an event log in the client; and

provide a request to initiate reporting of the logged URMC event identifying information.

943. A processor-readable medium storing processor-issuable instructions, wherein the processor issues instructions to:

provide a request to detect a plurality of universally resolvable media content ("URMC") events initiated at a client;

provide URMC event identifying information for each detected URMC event;

provide a request to determine if each detected URMC event is reportable based on the URMC event identifying information;

provide a request to determine a reporting category for each reportable URMC event based on the URMC event identifying information;

provide a request to record each reportable URMC event and the associated reporting category in an event log in the client; and

provide a request to initiate reporting of the logged URMC event identifying information.

944. An apparatus, comprising:

a memory;

a processor disposed in communication with said memory, and configured to issue a plurality of processing instructions stored in the memory, wherein the processor issues instructions to:

provide a request to detect a plurality of universally resolvable media content ("URMC") events initiated at a client;

provide URMC event identifying information for each detected URMC event;

provide a request to determine if each detected URMC event is reportable based on the URMC event identifying information;

provide a request to determine a reporting category for each reportable URMC event based on the URMC event identifying information;

provide a request to record each reportable URMC event and the associated reporting category in an event log in the client; and

provide a request to initiate reporting of the logged URMC event identifying information.

945. A processor-implemented method, comprising:

receiving from a requestor a payment request for usage of a universally resolvable media content ("URMC") item;

querying a URMC usage database to obtain the URMC item usage metric;

determining, based on URMC usage payment obligation rules associated with the requestor and the URMC item usage metric, a payment amount owed for usage of the URMC item; and

providing the determined payment amount to the requestor.

946. The method of claim 945, wherein the URMC usage payment obligation rules specify royalty rate for a unit of the usage metric.

947. The method of claim 946, wherein the royalty rate is specific to a geography.

948. The method of claim 945, wherein the payment amount is device license fees based on prorated share of the URMC item usage.

949. The method of claim 945, wherein the request specifies at least one criterion for selecting the URMC item.

950. The method of claim 945, further comprising querying a URMC reporting database using the specified criterion to obtain the URMC item.

951. The method of claim 945, wherein the URMC usage metric is play count.

952. The method of claim 945, wherein the URMC usage metric is number of license activations.

953. A system, comprising:

a memory;

a processor disposed in communication with said memory, and configured to issue a plurality of processing instructions stored in the memory, wherein the processor issues instructions to:

receive from a requestor a payment request for usage of a universally resolvable media content ("URMC") item;

query a URMC usage database to obtain the URMC item usage metric;

determine, based on URMC usage payment obligation rules associated with the requestor and the URMC item usage metric, a payment amount owed for usage of the URMC item; and

provide the determined payment amount to the requestor.

954. The system of claim 953, wherein the URMC usage payment obligation rules specify royalty rate for a unit of the usage metric.

955. The system of claim 954, wherein the royalty rate is specific to a geography.

956. The system of claim 953, wherein the payment amount is device license fees based on prorated share of the URMC item usage.

957. The system of claim 953, wherein the request specifies at least one criterion for selecting the URMC item.

958. The system of claim 953, further comprising instructions to query a URMC reporting database using the specified criterion to obtain the URMC item.

959. The system of claim 953, wherein the URMC usage metric is play count.

960. The system of claim 953, wherein the URMC usage metric is number of license activations.

961. A processor-readable medium storing processor-issuable instructions, wherein the processor issues instructions to:

receive from a requestor a payment request for usage of a universally resolvable media content ("URMC") item;

query a URMC usage database to obtain the URMC item usage metric;

determine, based on URMC usage payment obligation rules associated with the requestor and the URMC item usage metric, a payment amount owed for usage of the URMC item; and

provide the determined payment amount to the requestor.

962. The medium of claim 961, wherein the URMC usage payment obligation rules specify royalty rate for a unit of the usage metric.

963. The medium of claim 962, wherein the royalty rate is specific to a geography.

964. The medium of claim 961, wherein the payment amount is device license fees based on prorated share of the URMC item usage.

965. The medium of claim 961, wherein the request specifies at least one criterion for selecting the URMC item.

966. The medium of claim 961, further comprising instructions to query a URMC reporting database using the specified criterion to obtain the URMC item.

967. The medium of claim 961, wherein the URMC usage metric is play count.

968. The medium of claim 961, wherein the URMC usage metric is number of license activations.

969. An apparatus, comprising:

a memory;

a processor disposed in communication with said memory, and configured to issue a plurality of processing instructions stored in the memory, wherein the processor issues instructions to:

receive from a requestor a payment request for usage of a universally resolvable media content ("URMC") item;

query a URMC usage database to obtain the URMC item usage metric;

determine, based on URMC usage payment obligation rules associated with the requestor and the URMC item usage metric, a payment amount owed for usage of the URMC item; and

provide the determined payment amount to the requestor.

970. The apparatus of claim 969, wherein the URMC usage payment obligation rules specify royalty rate for a unit of the usage metric.

971. The apparatus of claim 970, wherein the royalty rate is specific to a geography.

972. The apparatus of claim 969, wherein the payment amount is device license fees based on prorated share of the URMC item usage.

973. The apparatus of claim 969, wherein the request specifies at least one criterion for selecting the URMC item.

974. The apparatus of claim 969, further comprising instructions to query a URMC reporting database using the specified criterion to obtain the URMC item.

975. The apparatus of claim 969, wherein the URMC usage metric is play count.

976. The apparatus of claim 969, wherein the URMC usage metric is number of license activations.

977. A processor-implemented method, comprising:

providing from a requestor a payment request for usage of a universally resolvable media content ("URMC") item;

providing a request to query a URMC usage database to obtain the URMC item usage metric;

providing a request to determine, based on URMC usage payment obligation rules associated with the requestor and the URMC item usage metric, a payment amount owed for usage of the URMC item; and

obtaining the determined payment amount to the requestor.

978. A system, comprising:

a memory;

a processor disposed in communication with said memory, and configured to issue a plurality of processing instructions stored in the memory, wherein the processor issues instructions to:

provide from a requestor a payment request for usage of a universally resolvable media content ("URMC") item;

provide a request to query a URMC usage database to obtain the URMC item usage metric;

provide a request to determine, based on URMC usage payment obligation rules associated with the requestor and the URMC item usage metric, a payment amount owed for usage of the URMC item; and

obtain the determined payment amount to the requestor.

979. A processor-readable medium storing processor-issuable instructions, wherein the processor issues instructions to:

provide from a requestor a payment request for usage of a universally resolvable media content ("URMC") item;

provide a request to query a URMC usage database to obtain the URMC item usage metric;

provide a request to determine, based on URMC usage payment obligation rules associated with the requestor and the URMC item usage metric, a payment amount owed for usage of the URMC item; and

obtain the determined payment amount to the requestor.

980. An apparatus, comprising:

a memory;

a processor disposed in communication with said memory, and configured to issue a plurality of processing instructions stored in the memory, wherein the processor issues instructions to:

provide from a requestor a payment request for usage of a universally resolvable media content ("URMC") item;

provide a request to query a URMC usage database to obtain the URMC item usage metric;

provide a request to determine, based on URMC usage payment obligation rules associated with the requestor and the URMC item usage metric, a payment amount owed for usage of the URMC item; and

obtain the determined payment amount to the requestor.

981. A processor-implemented method, comprising:

obtaining from a user of a universally resolvable media content ("URMC") service a request to purchase an unlocked URMC item;

obtaining the user's social influence metric in the service;

obtaining a purchase price associated with the URMC content item;

determining, based on the user's social influence metric, a discount;

providing the user an option to purchase the URMC content item at a purchase price reduced by the discount;

receiving from the user an indication and an authorization to purchase the URMC item;

charging an account associated with the user the purchase price reduced by the discount; and

providing the user a mechanism for unlocking the URMC item.

982. The method of claim 981, wherein the unlocking mechanism is a digital rights management (DRM) free version of the URMC item provided to the client.

983. The method of claim 981, wherein the unlocking mechanism is a decryption key configured to unlock the URMC item by the user's client software.

984. The method of claim 981, wherein the unlocked URMC item has no rights management restrictions.

985. The method of claim 981, wherein the unlocked URMC item has no encryption

986. The method of claim 981, wherein the social influence metric is a number of points associated with a social activity.

987. The method of claim 986, wherein the discount is triggered when the number of social activity points associated with the user exceeds a threshold.

988. A system, comprising:

a memory;

a processor disposed in communication with said memory, and configured to issue a plurality of processing instructions stored in the memory, wherein the processor issues instructions to:

obtain from a user of a universally resolvable media content ("URMC") service a request to purchase an unlocked URMC item;

obtain the user's social influence metric in the service;

obtain a purchase price associated with the URMC content item;

determine, based on the user's social influence metric, a discount;

provide the user an option to purchase the URMC content item at a purchase price reduced by the discount;

receive from the user an indication and an authorization to purchase the URMC item;

charge an account associated with the user the purchase price reduced by the discount; and

provide the user a mechanism for unlocking the URMC item.

989. The system of claim 988, wherein the unlocking mechanism is a digital rights management (DRM) free version of the URMC item provided to the client.

990. The system of claim 988, wherein the unlocking mechanism is a decryption key configured to unlock the URMC item by the user's client software.

991. The system of claim 988, wherein the unlocked URMC item has no rights management restrictions.

992. The system of claim 988, wherein the unlocked URMC item has no encryption

993. The system of claim 988, wherein the social influence metric is a number of points associated with a social activity.

994. The system of claim 993, wherein the discount is triggered when the number of social activity points associated with the user exceeds a threshold.

995. A processor-readable medium storing processor-issuable instructions, wherein the processor issues instructions to:

obtain from a user of a universally resolvable media content ("URMC") service a request to purchase an unlocked URMC item;

obtain the user's social influence metric in the service;

obtain a purchase price associated with the URMC content item;

determine, based on the user's social influence metric, a discount;

provide the user an option to purchase the URMC content item at a purchase price reduced by the discount;

receive from the user an indication and an authorization to purchase the URMC item;

charge an account associated with the user the purchase price reduced by the discount; and

provide the user a mechanism for unlocking the URMC item.

996. The medium of claim 995, wherein the unlocking mechanism is a digital rights management (DRM) free version of the URMC item provided to the client.

997. The medium of claim 995, wherein the unlocking mechanism is a decryption key configured to unlock the URMC item by the user's client software.

998. The medium of claim 995, wherein the unlocked URMC item has no rights management restrictions.

999. The medium of claim 995, wherein the unlocked URMC item has no encryption

1000. The medium of claim 995, wherein the social influence metric is a number of points associated with a social activity.

1001. The medium of claim 1000, wherein the discount is triggered when the number of social activity points associated with the user exceeds a threshold.

1002. An apparatus, comprising:

a memory;

a processor disposed in communication with said memory, and configured to issue a plurality of processing instructions stored in the memory, wherein the processor issues instructions to:

obtain from a user of a universally resolvable media content ("URMC") service a request to purchase an unlocked URMC item;

obtain the user's social influence metric in the service;

obtain a purchase price associated with the URMC content item;

determine, based on the user's social influence metric, a discount;

provide the user an option to purchase the URMC content item at a purchase price reduced by the discount;

receive from the user an indication and an authorization to purchase the URMC item;

charge an account associated with the user the purchase price reduced by the discount; and

provide the user a mechanism for unlocking the URMC item.

1003. The apparatus of claim 1002, wherein the unlocking mechanism is a digital rights management (DRM) free version of the URMC item provided to the client.

1004. The apparatus of claim 1002, wherein the unlocking mechanism is a decryption key configured to unlock the URMC item by the user's client software.

1005. The apparatus of claim 1002, wherein the unlocked URMC item has no rights management restrictions.

1006. The apparatus of claim 1002, wherein the unlocked URMC item has no encryption

1007. The apparatus of claim 1002, wherein the social influence metric is a number of points associated with a social activity.

1008. The apparatus of claim 1007, wherein the discount is triggered when the number of social activity points associated with the user exceeds a threshold.

1009. A processor-implemented method, comprising:

obtaining a request to purchase an encryption free universally resolvable media content ("URMC") item from a user of the URMC service;

obtaining a purchase price associated with the content item;

determining whether the user meets a discount criteria for purchasing the encryption free content item;

calculating, based on the determining, a discounted purchase price;

providing the user an option to purchase the encryption free content item at the discounted purchase price;

receiving from the user an indication and an authorization to purchase the encryption free content item;

charging an account associated with the user the discounted purchase price; and

providing the user the encryption free content item.

1010. The method of claim 1009, wherein the discount criteria includes reaching a threshold number of points via influencing activity.

1011. The method of claim 1009, wherein the discount criteria includes having the content item in a playlist created by the user.

1012. The method of claim 1011, wherein the purchase price is progressively discounted by an amount for every degree of separation users that add the content.

1013. The method of claim 1009, wherein the discount criteria includes reaching a threshold number of plays of the content item discovered via the user's playlist or library.

1014. The method of claim 1009, wherein the discount criteria includes reaching a threshold number of users playing the content item discovered via the user's playlist or library.

1015. The method of claim 1009, wherein the discount criteria includes reaching a threshold number of encryption free purchases of content item.

1016. A system, comprising:

a memory;

a processor disposed in communication with said memory, and configured to issue a plurality of processing instructions stored in the memory, wherein the processor issues instructions to:

obtain a request to purchase an encryption free universally resolvable media content ("URMC") item from a user of the URMC service;

obtain a purchase price associated with the content item;

determine whether the user meets a discount criteria for purchasing the encryption free content item;

calculate, based on the determining, a discounted purchase price;

provide the user an option to purchase the encryption free content item at the discounted purchase price;

receive from the user an indication and an authorization to purchase the encryption free content item;

charge an account associated with the user the discounted purchase price; and

provide the user the encryption free content item.

1017. The system of claim 1016, wherein the discount criteria includes reaching a threshold number of points via influencing activity.

1018. The system of claim 1016, wherein the discount criteria includes having the content item in a playlist created by the user.

1019. The system of claim 1018, wherein the purchase price is progressively discounted by an amount for every degree of separation users that add the content.

1020. The system of claim 1016, wherein the discount criteria includes reaching a threshold number of plays of the content item discovered via the user's playlist or library.

1021. The system of claim 1016, wherein the discount criteria includes reaching a threshold number of users playing the content item discovered via the user's playlist or library.

1022. The system of claim 1016, wherein the discount criteria includes reaching a threshold number of encryption free purchases of content item.

1023. A processor-readable medium storing processor-issuable instructions, wherein the processor issues instructions to:

obtain a request to purchase an encryption free universally resolvable media content ("URMC") item from a user of the URMC service;

obtain a purchase price associated with the content item;

determine whether the user meets a discount criteria for purchasing the encryption free content item;

calculate, based on the determining, a discounted purchase price;

provide the user an option to purchase the encryption free content item at the discounted purchase price;

receive from the user an indication and an authorization to purchase the encryption free content item;

charge an account associated with the user the discounted purchase price; and

provide the user the encryption free content item.

1024. The medium of claim 1023, wherein the discount criteria includes reaching a threshold number of points via influencing activity.

1025. The medium of claim 1023, wherein the discount criteria includes having the content item in a playlist created by the user.

1026. The medium of claim 1025, wherein the purchase price is progressively discounted by an amount for every degree of separation users that add the content.

1027. The medium of claim 1023, wherein the discount criteria includes reaching a threshold number of plays of the content item discovered via the user's playlist or library.

1028. The medium of claim 1023, wherein the discount criteria includes reaching a threshold number of users playing the content item discovered via the user's playlist or library.

1029. The medium of claim 1023, wherein the discount criteria includes reaching a threshold number of encryption free purchases of content item.

1030. An apparatus, comprising:

a memory;

a processor disposed in communication with said memory, and configured to issue a plurality of processing instructions stored in the memory, wherein the processor issues instructions to:

obtain a request to purchase an encryption free universally resolvable media content ("URMC") item from a user of the URMC service;

obtain a purchase price associated with the content item;

determine whether the user meets a discount criteria for purchasing the encryption free content item;

calculate, based on the determining, a discounted purchase price;

provide the user an option to purchase the encryption free content item at the discounted purchase price;

receive from the user an indication and an authorization to purchase the encryption free content item;

charge an account associated with the user the discounted purchase price; and

provide the user the encryption free content item.

1031. The apparatus of claim 1030, wherein the discount criteria includes reaching a threshold number of points via influencing activity.

1032. The apparatus of claim 1030, wherein the discount criteria includes having the content item in a playlist created by the user.

1033. The apparatus of claim 1032, wherein the purchase price is progressively discounted by an amount for every degree of separation users that add the content.

1034. The apparatus of claim 1030, wherein the discount criteria includes reaching a threshold number of plays of the content item discovered via the user's playlist or library.

1035. The apparatus of claim 1030, wherein the discount criteria includes reaching a threshold number of users playing the content item discovered via the user's playlist or library.

1036. The apparatus of claim 1030, wherein the discount criteria includes reaching a threshold number of encryption free purchases of content item.

1037. A processor-implemented method, comprising:

obtaining from a user of a universally resolvable media content ("URMC") service a request to purchase an unlocked URMC item;

obtaining a purchase price associated with the URMC item;

providing the user an option to purchase the URMC item at a purchase price;

receiving from the user an indication and an authorization to purchase the URMC item;

charging an account associated with the user the purchase price; and

providing the user a mechanism for unlocking the URMC item.

1038. A system, comprising:

a memory;

a processor disposed in communication with said memory, and configured to issue a plurality of processing instructions stored in the memory, wherein the processor issues instructions to:

obtain from a user of a universally resolvable media content ("URMC") service a request to purchase an unlocked URMC item;

obtain a purchase price associated with the URMC item;

provide the user an option to purchase the URMC item at a purchase price;

receive from the user an indication and an authorization to purchase the URMC item;

charge an account associated with the user the purchase price; and

provide the user a mechanism for unlocking the URMC item.

1039. A processor-readable medium storing processor-issuable instructions, wherein the processor issues instructions to:

obtain from a user of a universally resolvable media content ("URMC") service a request to purchase an unlocked URMC item;

obtain a purchase price associated with the URMC item;

provide the user an option to purchase the URMC item at a purchase price;

receive from the user an indication and an authorization to purchase the URMC item;

charge an account associated with the user the purchase price; and

provide the user a mechanism for unlocking the URMC item.

1040. An apparatus, comprising:

a memory;

a processor disposed in communication with said memory, and configured to issue a plurality of processing instructions stored in the memory, wherein the processor issues instructions to:

obtain from a user of a universally resolvable media content ("URMC") service a request to purchase an unlocked URMC item;

obtain a purchase price associated with the URMC item;

provide the user an option to purchase the URMC item at a purchase price;

receive from the user an indication and an authorization to purchase the URMC item;

charge an account associated with the user the purchase price; and

provide the user a mechanism for unlocking the URMC item.

1041. A processor implemented method comprising:

detecting a request to engage a universally resolvable media content ("URMC") item;

obtaining an expiration date for a URMC license token associated with the URMC item;

determining, based on the obtained expiration date, whether the license token is expired;

discarding a license key associated with the expired license token;

denying the request to engage the URMC item with the associated expired license token;

providing a request for an updated token and requisite credentials for the updated token;

obtaining a response including an updated token; and

engaging the requested URMC item with an associated valid updated token.

1042. The method of claim 1041, wherein the response includes a user node identifier and at least one subscription node identifier.

1043. The method of claim 1042, wherein the response includes the user node to the at least one subscription node link.

1044. The method of claim 1043, wherein the subscription node specifies a territory where a user's device is licensed for use.

1045. The method of claim 1043, wherein the subscription node specifies a territory where the URMC item is licensed for use.

1046. The method of claim 1041, wherein the response includes a user to device link having an associated expiration date.

1047. The method of claim 1043, further comprising retrieving a key for territory specified by the subscription node for decrypting encryption for engaging the URMC item.

1048. A system, comprising:

a memory;

a processor disposed in communication with said memory, and configured to issue a plurality of processing instructions stored in the memory, wherein the processor issues instructions to:

detect a request to engage a universally resolvable media content ("URMC") item;

obtain an expiration date for a URMC license token associated with the URMC item;

determine, based on the obtained expiration date, whether the license token is expired;

discard a license key associated with the expired license token;

deny the request to engage the URMC item with the associated expired license token;

provide a request for an updated token and requisite credentials for the updated token;

obtain a response including an updated token; and

engage the requested URMC item with an associated valid updated token.

1049. The system of claim 1048, wherein the response includes a user node identifier and at least one subscription node identifier.

1050. The system of claim 1049, wherein the response includes the user node to the at least one subscription node link.

1051. The system of claim 1050, wherein the subscription node specifies a territory where a user's device is licensed for use.

1052. The system of claim 1050, wherein the subscription node specifies a territory where the URMC item is licensed for use.

1053. The system of claim 1048, wherein the response includes a user to device link having an associated expiration date.

1054. The system of claim 1050, further comprising instructions to retrieve a key for territory specified by the subscription node for decrypting encryption for engaging the URMC item.

1055. A processor-readable medium storing processor-issuable instructions, wherein the processor issues instructions to:

detect a request to engage a universally resolvable media content ("URMC") item;

obtain an expiration date for a URMC license token associated with the URMC item;

determine, based on the obtained expiration date, whether the license token is expired;

discard a license key associated with the expired license token;

deny the request to engage the URMC item with the associated expired license token;

provide a request for an updated token and requisite credentials for the updated token;

obtain a response including an updated token; and

engage the requested URMC item with an associated valid updated token.

1056. The medium of claim 1055, wherein the response includes a user node identifier and at least one subscription node identifier.

1057. The medium of claim 1056, wherein the response includes the user node to the at least one subscription node link.

1058. The medium of claim 1057, wherein the subscription node specifies a territory where a user's device is licensed for use.

1059. The medium of claim 1057, wherein the subscription node specifies a territory where the URMC item is licensed for use.

1060. The medium of claim 1055, wherein the response includes a user to device link having an associated expiration date.

1061. The medium of claim 1057, further comprising instructions to retrieve a key for territory specified by the subscription node for decrypting encryption for engaging the URMC item.

1062. An apparatus, comprising:

a memory;

a processor disposed in communication with said memory, and configured to issue a plurality of processing instructions stored in the memory, wherein the processor issues instructions to:

detect a request to engage a universally resolvable media content ("URMC") item;

obtain an expiration date for a URMC license token associated with the URMC item;

determine, based on the obtained expiration date, whether the license token is expired;

discard a license key associated with the expired license token;

deny the request to engage the URMC item with the associated expired license token;

provide a request for an updated token and requisite credentials for the updated token;

obtain a response including an updated token; and

engage the requested URMC item with an associated valid updated token.

1063. The apparatus of claim 1062, wherein the response includes a user node identifier and at least one subscription node identifier.

1064. The apparatus of claim 1063, wherein the response includes the user node to the at least one subscription node link.

1065. The apparatus of claim 1064, wherein the subscription node specifies a territory where a user's device is licensed for use.

1066. The apparatus of claim 1064, wherein the subscription node specifies a territory where the URMC item is licensed for use.

1067. The apparatus of claim 1062, wherein the response includes a user to device link having an associated expiration date.

1068. The apparatus of claim 1064, further comprising instructions to retrieve a key for territory specified by the subscription node for decrypting encryption for engaging the URMC item.

1069. A processor-implemented method, comprising:

obtaining a request for a license token for decrypting a universally resolvable media content ("URMC") item for a user of the URMC service;

determining whether an issued link between the user and at least one device associated with the request is valid;

obtaining confirmation of at least one instance of content usage reporting for the issued link from the device;

determining, based on the valid issued link and the obtained confirmation, an expiration date for a new link;

generating and sending the requested license token for the new link to the device; and

issuing and sending the new link to the device.

1070. A system, comprising:

a memory;

a processor disposed in communication with said memory, and configured to issue a plurality of processing instructions stored in the memory, wherein the processor issues instructions to:

obtain a request for a license token for decrypting a universally resolvable media content ("URMC") item for a user of the URMC service;

determine whether an issued link between the user and at least one device associated with the request is valid;

obtain confirmation of at least one instance of content usage reporting for the issued link from the device;

determine, based on the valid issued link and the obtained confirmation, an expiration date for a new link;

generate and send the requested license token for the new link to the device; and

issue and send the new link to the device.

1071. A processor-readable medium storing processor-issuable instructions, wherein the processor issues instructions to:

obtain a request for a license token for decrypting a universally resolvable media content ("URMC") item for a user of the URMC service;

determine whether an issued link between the user and at least one device associated with the request is valid;

obtain confirmation of at least one instance of content usage reporting for the issued link from the device;

determine, based on the valid issued link and the obtained confirmation, an expiration date for a new link;

generate and send the requested license token for the new link to the device; and

issue and send the new link to the device.

1072. An apparatus, comprising:

a memory;

a processor disposed in communication with said memory, and configured to issue a plurality of processing instructions stored in the memory, wherein the processor issues instructions to:

obtain a request for a license token for decrypting a universally resolvable media content ("URMC") item for a user of the URMC service;

determine whether an issued link between the user and at least one device associated with the request is valid;

obtain confirmation of at least one instance of content usage reporting for the issued link from the device;

determine, based on the valid issued link and the obtained confirmation, an expiration date for a new link;

generate and send the requested license token for the new link to the device; and

issue and send the new link to the device.

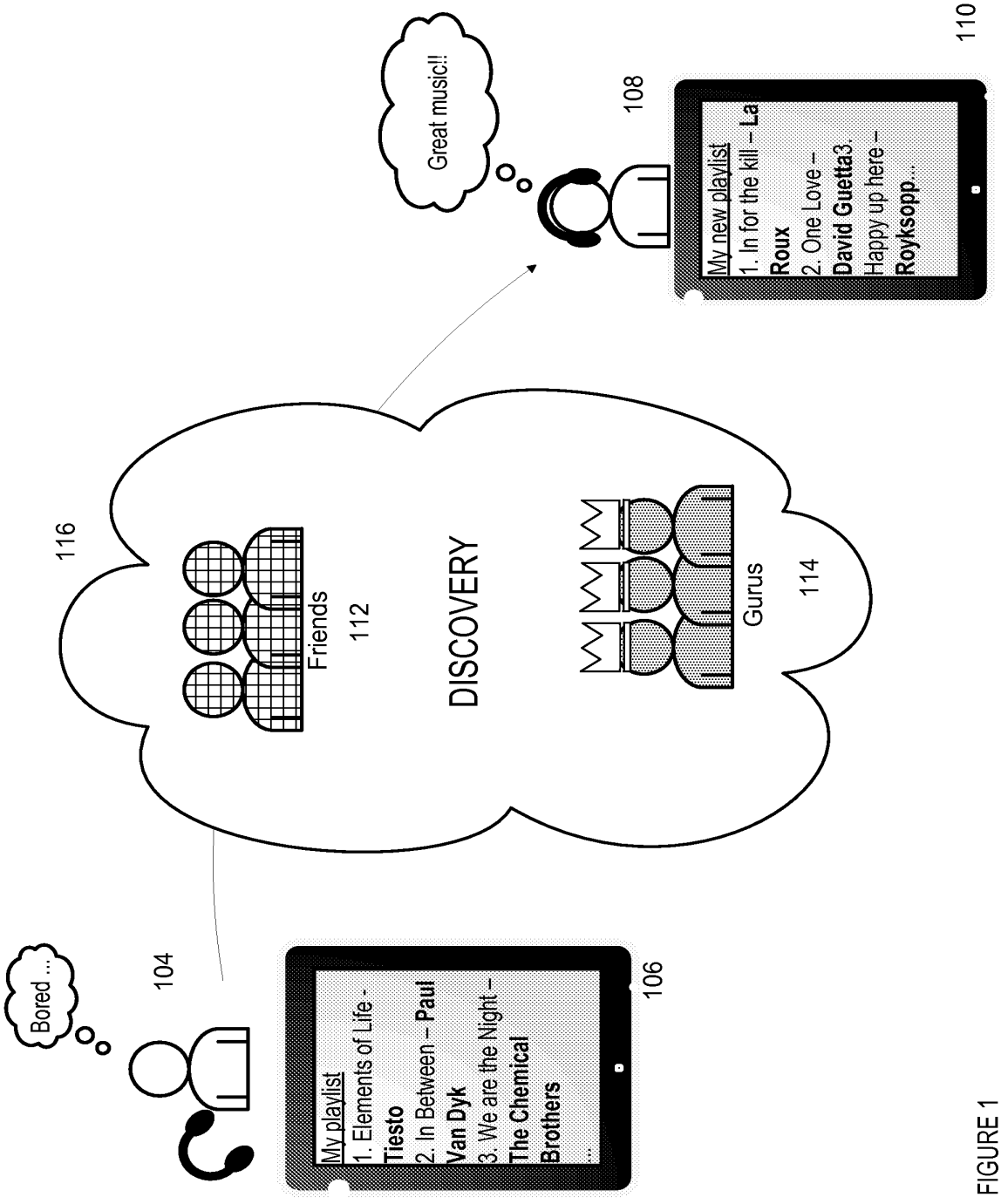

Bored ...
104
My playlist
1. Elements of Life - Tiesto
2. In Between – Paul Van Dyk
3. We are the Night – The Chemical Brothers
...
106
116
Friends
112
DISCOVERY
Gurus
114
Great music!!
108
My new playlist
1. In for the kill – La Roux
2. One Love – David Guetta3. Happy up here – Royksopp...
110

FIGURE 1

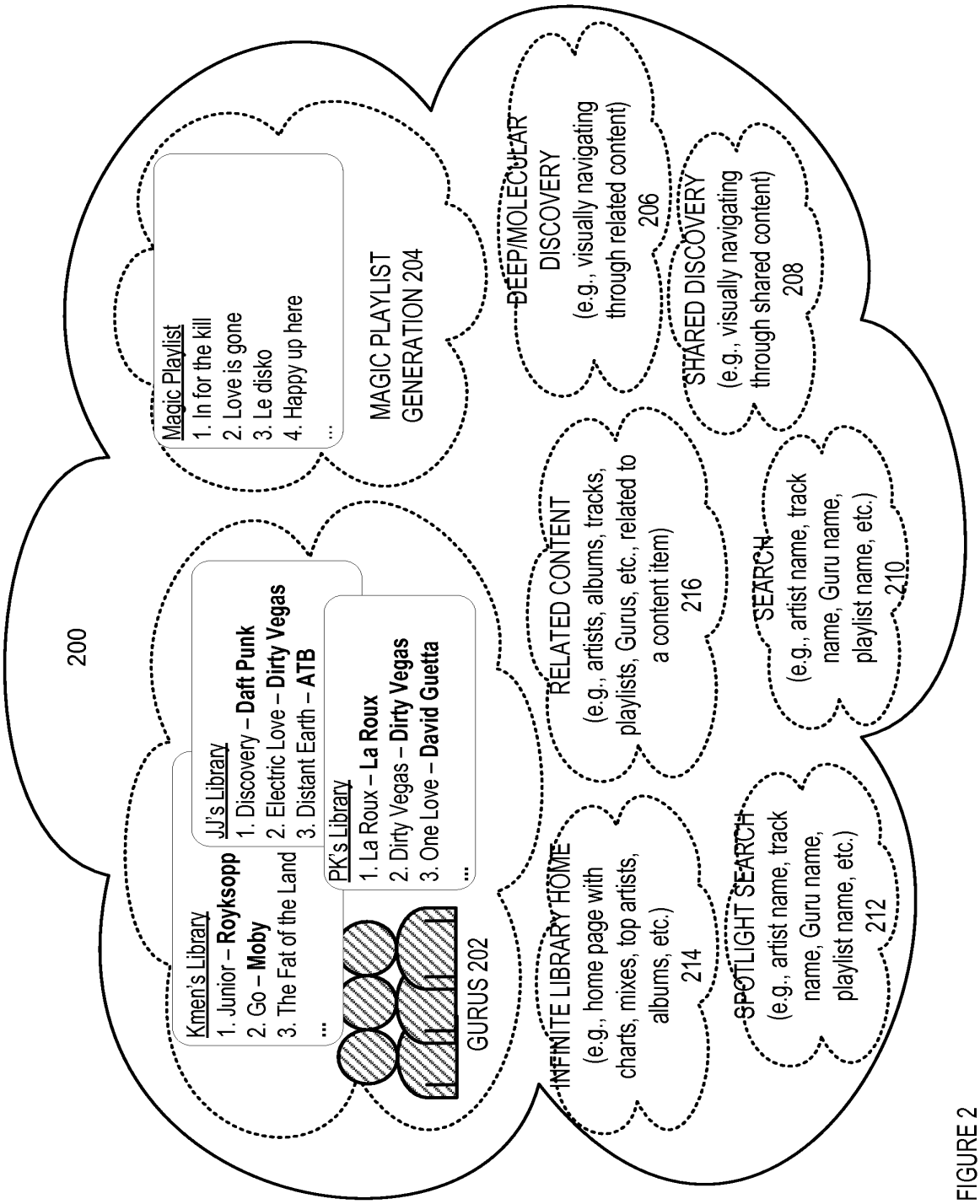

200
Kmen's Library
1. Junior – Royksopp
2. Go – Moby
3. The Fat of the Land
...
JJ's Library
1. Discovery – Daft Punk
2. Electric Love – Dirty Vegas
3. Distant Earth – ATB
...
PK's Library
1. La Roux – La Roux
2. Dirty Vegas – Dirty Vegas
3. One Love – David Guetta
...
GURUS 202
Magic Playlist
1. In for the kill
2. Love is gone
3. Le disko
4. Happy up here
...
MAGIC PLAYLIST GENERATION 204
DEEP/MOLECULAR DISCOVERY
(e.g., visually navigating through related content)
206
SHARED DISCOVERY
(e.g., visually navigating through shared content)
208
RELATED CONTENT
(e.g., artists, albums, tracks, playlists, Gurus, etc., related to a content item)
216
SEARCH
(e.g., artist name, track name, Guru name, playlist name, etc.)
210
INFINITE LIBRARY HOME
(e.g., home page with charts, mixes, top artists, albums, etc.)
214
SPOTLIGHT SEARCH
(e.g., artist name, track name, Guru name, playlist name, etc.)
212

FIGURE 2

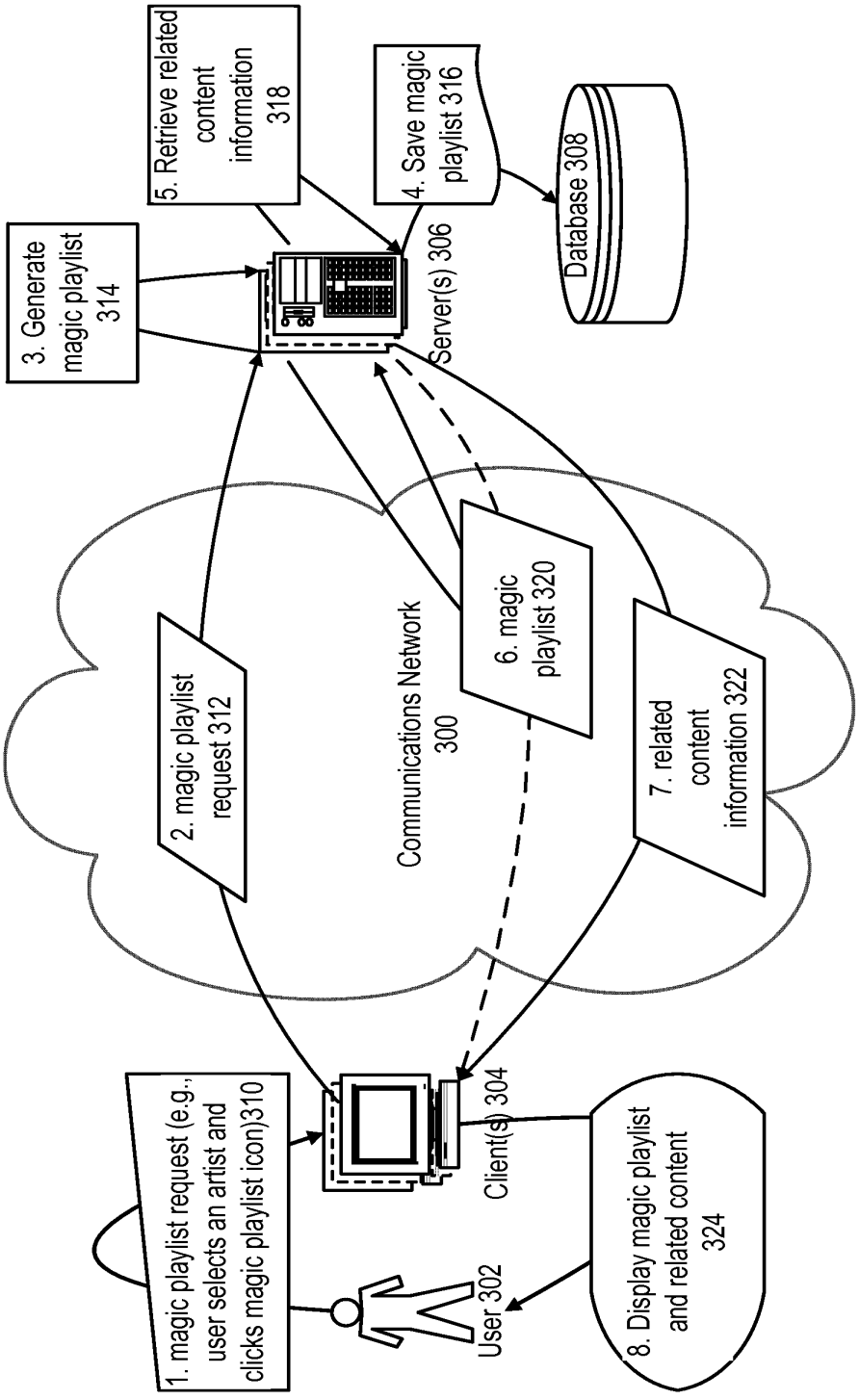

1. magic playlist request (e.g., user selects an artist and clicks magic playlist icon)310
User 302
Client(s) 304
2. magic playlist request 312
Communications Network 300
3. Generate magic playlist 314
Server(s) 306
4. Save magic playlist 316
5. Retrieve related content information 318
Database 308
6. magic playlist 320
7. related content information 322
8. Display magic playlist and related content 324

FIGURE 3

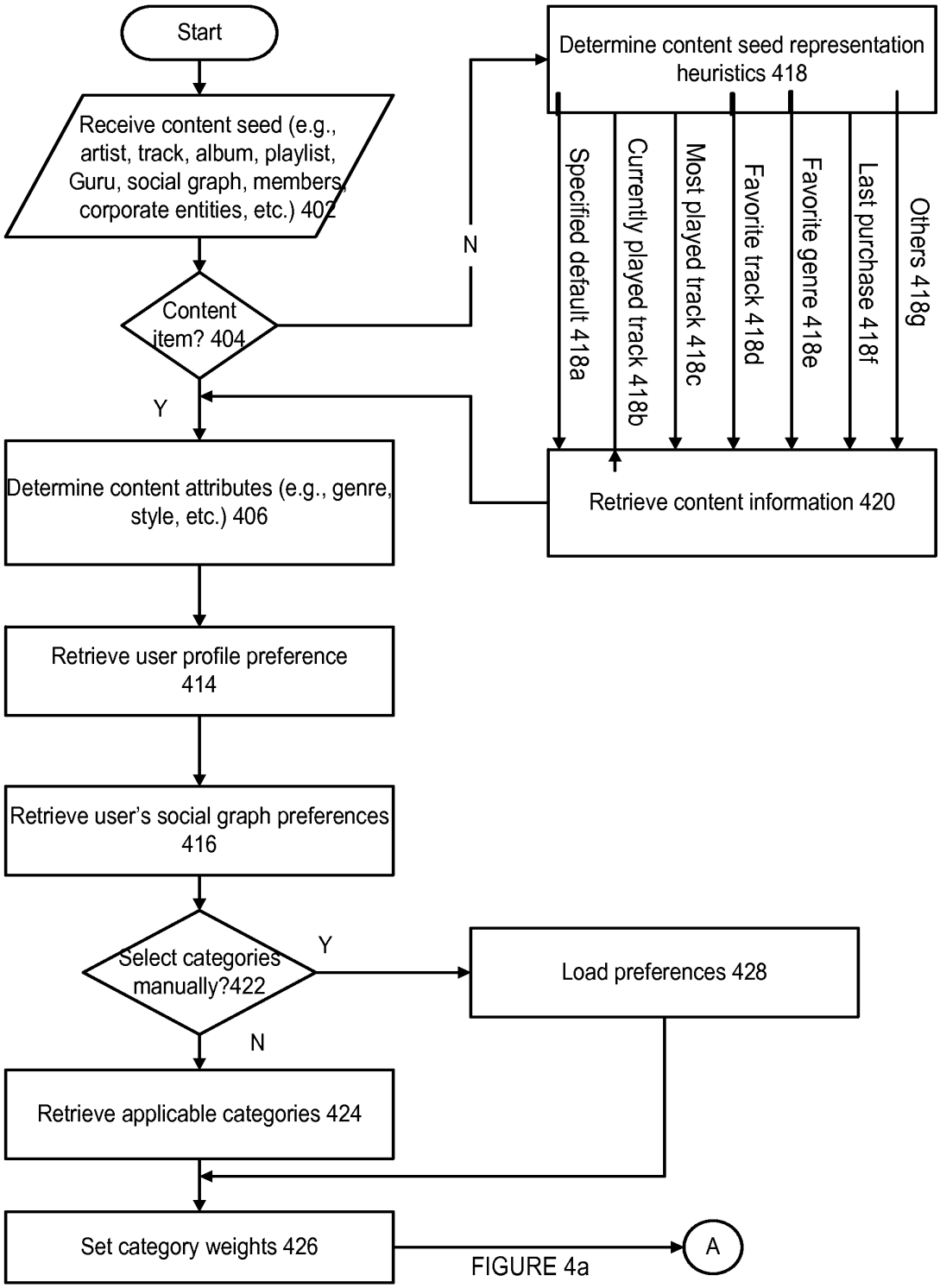

Start
Receive content seed (e.g., artist, track, album, playlist, Guru, social graph, members, corporate entities, etc.) 402
Content item? 404
N
Y
Determine content seed representation heuristics 418
Specified default 418a
Currently played track 418b
Most played track 418c
Favorite track 418d
Favorite genre 418e
Last purchase 418f
Others 418g
Retrieve content information 420
Determine content attributes (e.g., genre, style, etc.) 406
Retrieve user profile preference 414
Retrieve user's social graph preferences 416
Select categories manually?422
Y
N
Load preferences 428
Retrieve applicable categories 424
Set category weights 426
A

FIGURE 4a

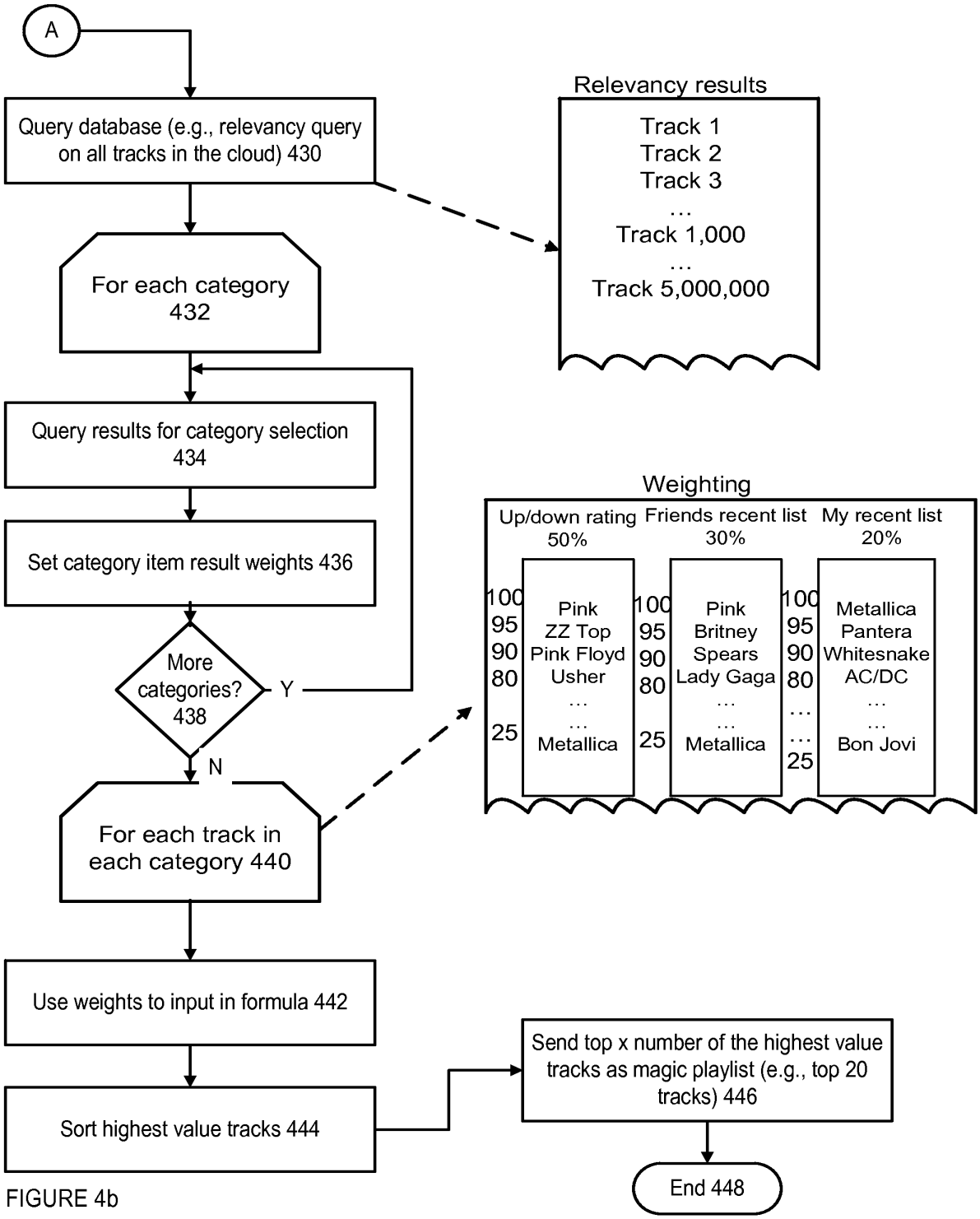

A
Query database (e.g., relevancy query on all tracks in the cloud) 430
Relevancy results
Track 1
Track 2
Track 3
…
Track 1,000
…
Track 5,000,000
For each category 432
Query results for category selection 434
Set category item result weights 436
Weighting
Up/down rating 50%
Friends recent list 30%
My recent list 20%
100
95
90
80
25
Pink
ZZ Top
Pink Floyd
Usher
…
Metallica
Pink
Britney Spears
Lady Gaga
…
Metallica
Metallica
Pantera
Whitesnake
AC/DC
…
Bon Jovi
More categories? 438
Y
N
For each track in each category 440
Use weights to input in formula 442
Sort highest value tracks 444
Send top x number of the highest value tracks as magic playlist (e.g., top 20 tracks) 446
End 448

FIGURE 4b

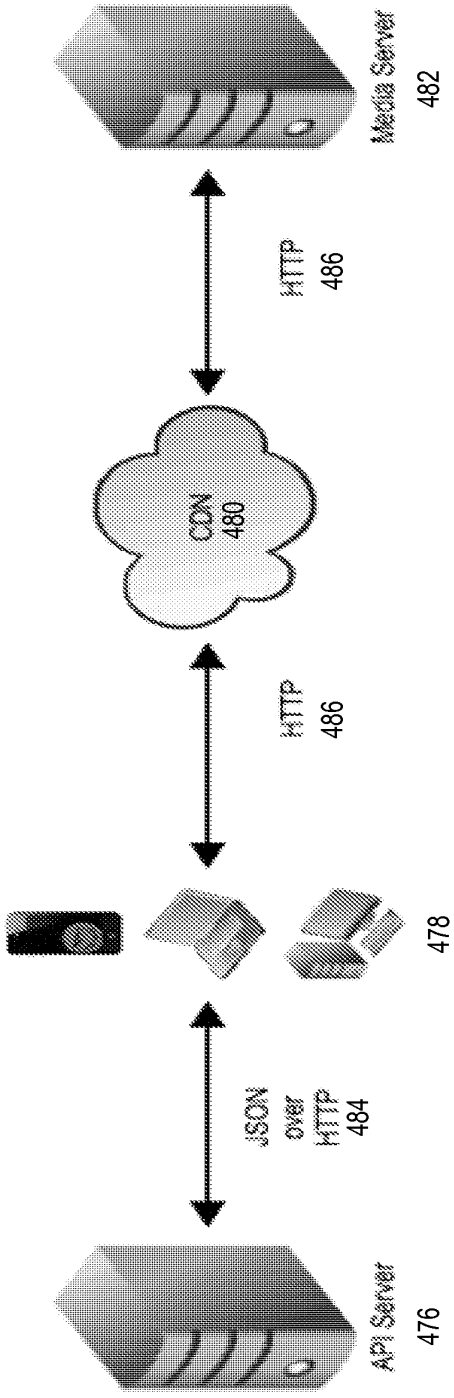

Media Server
482
HTTP
486
CDN
480
HTTP
486
478
JSON
over
HTTP
484
API Server
476

FIGURE 4c

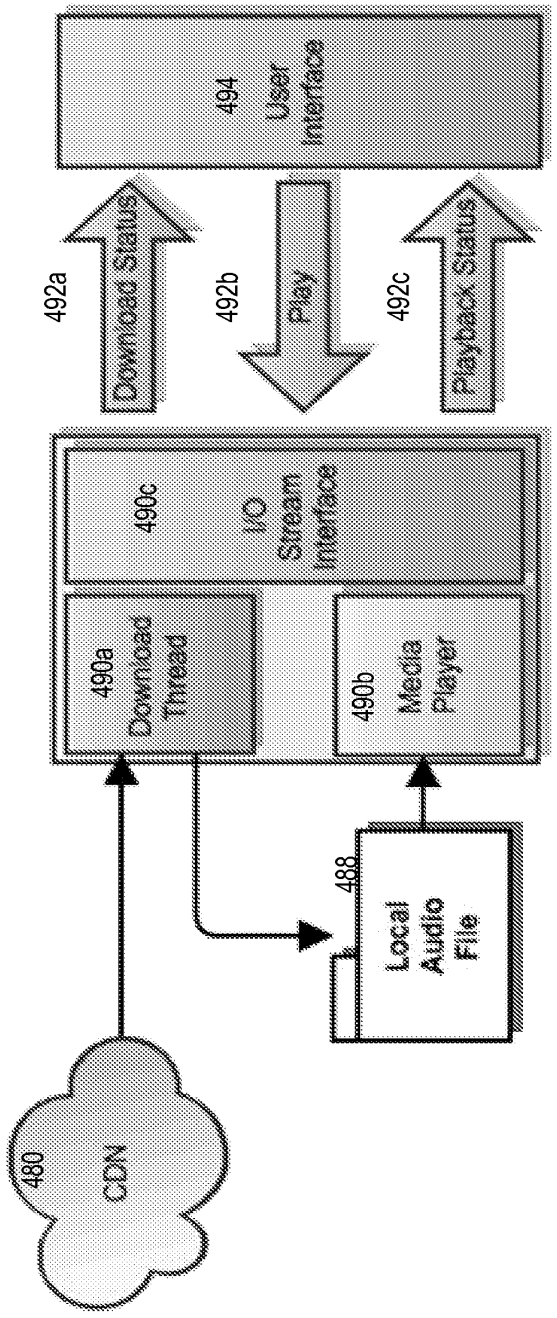

494
User Interface
492a
Download Status
492b
Play
492c
Playback Status
490c
I/O Stream Interface
490a
Download Thread
490b
Media Player
488
Local Audio File
480
CDN

FIGURE 4d

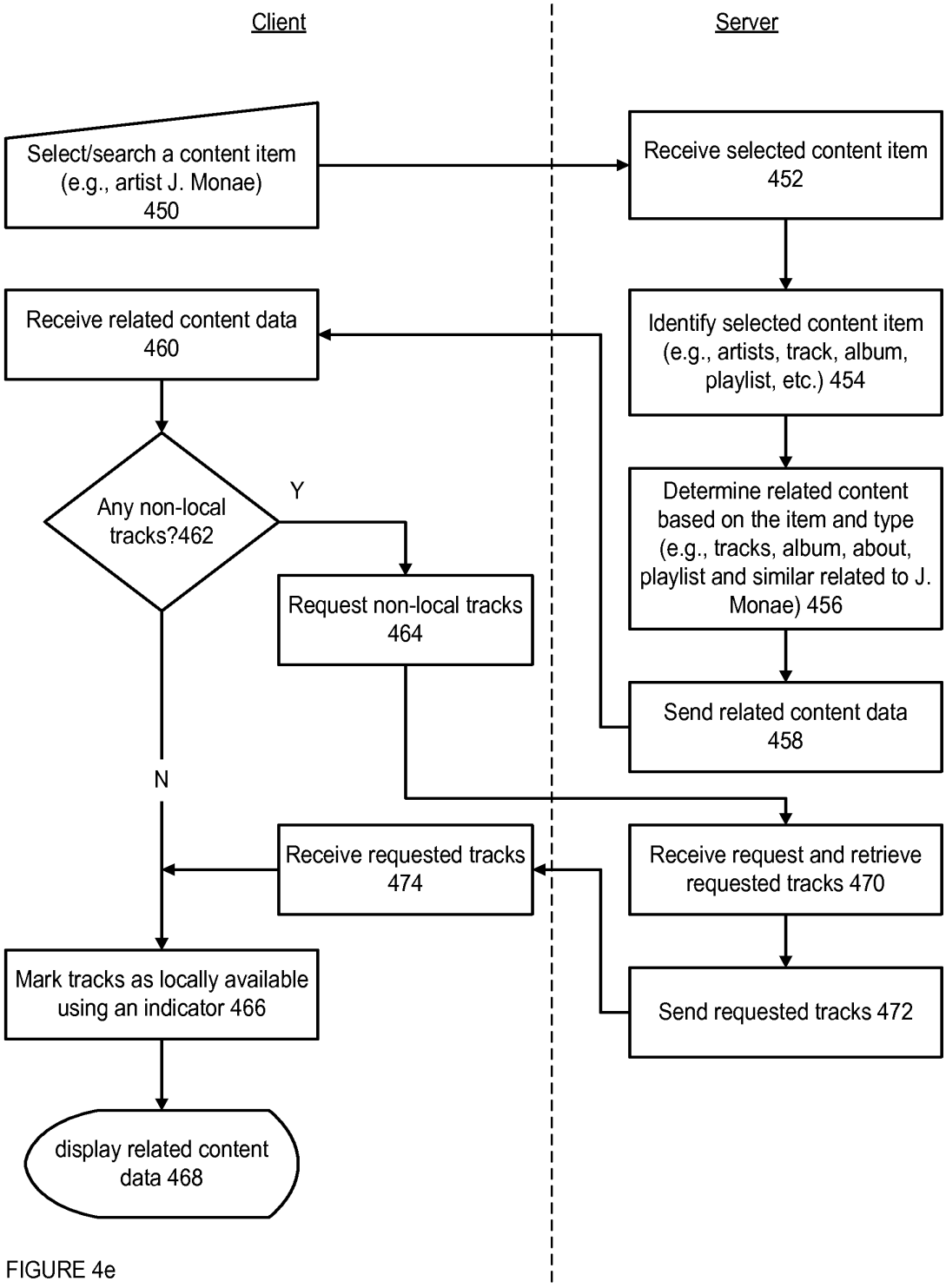

Client
Server
Select/search a content item (e.g., artist J. Monae) 450
Receive selected content item 452
Receive related content data 460
Identify selected content item (e.g., artists, track, album, playlist, etc.) 454
Any non-local tracks?462
Y
Determine related content based on the item and type (e.g., tracks, album, about, playlist and similar related to J. Monae) 456
Request non-local tracks 464
Send related content data 458
N
Receive requested tracks 474
Receive request and retrieve requested tracks 470
Mark tracks as locally available using an indicator 466
Send requested tracks 472
display related content data 468

FIGURE 4e

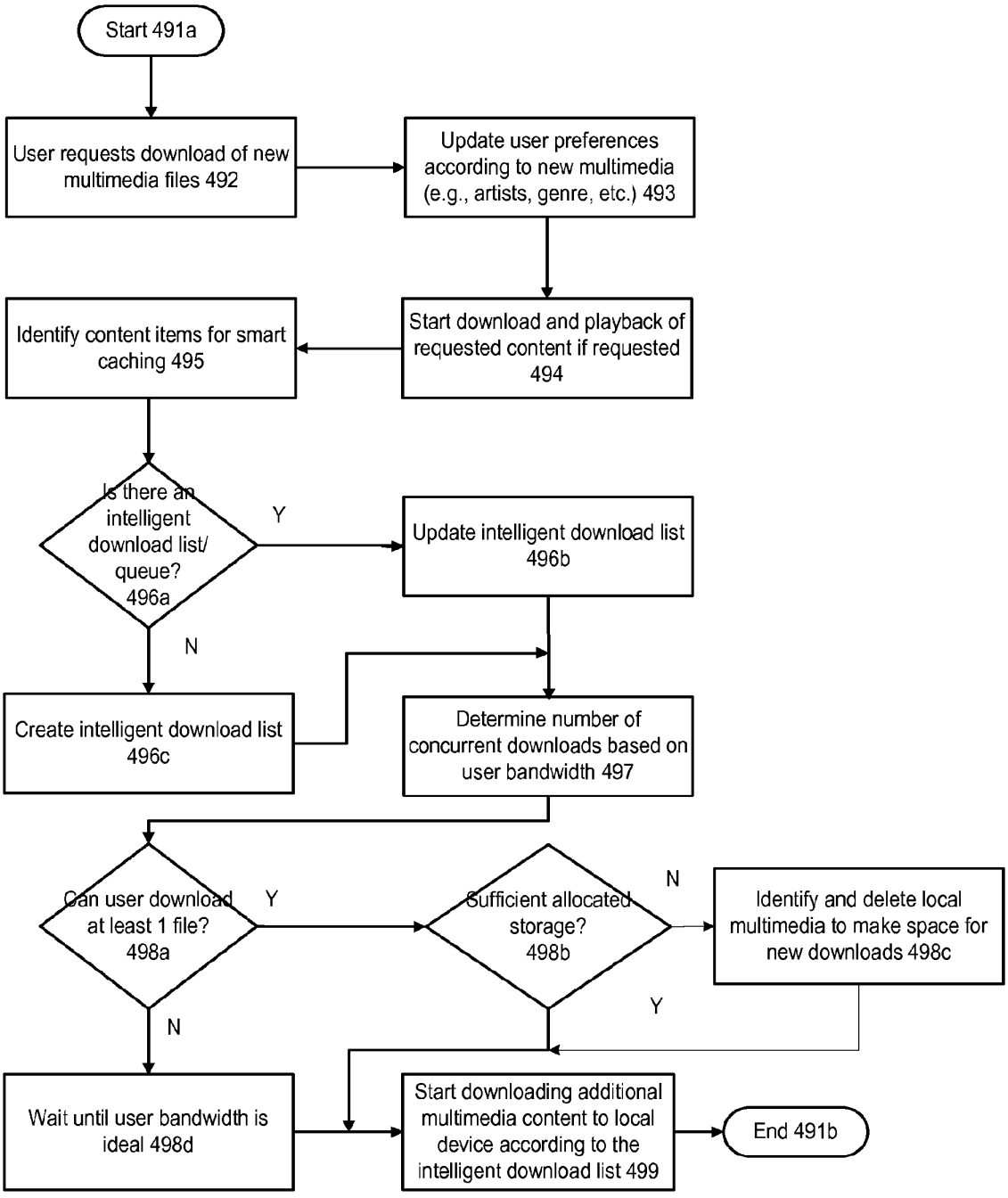

Start 491a
User requests download of new multimedia files 492
Update user preferences according to new multimedia (e.g., artists, genre, etc.) 493
Start download and playback of requested content if requested 494
Identify content items for smart caching 495
Is there an intelligent download list/ queue? 496a
Y
N
Update intelligent download list 496b
Create intelligent download list 496c
Determine number of concurrent downloads based on user bandwidth 497
Can user download at least 1 file? 498a
Y
N
Sufficient allocated storage? 498b
N
Y
Identify and delete local multimedia to make space for new downloads 498c
Wait until user bandwidth is ideal 498d
Start downloading additional multimedia content to local device according to the intelligent download list 499
End 491b

FIGURE 4f

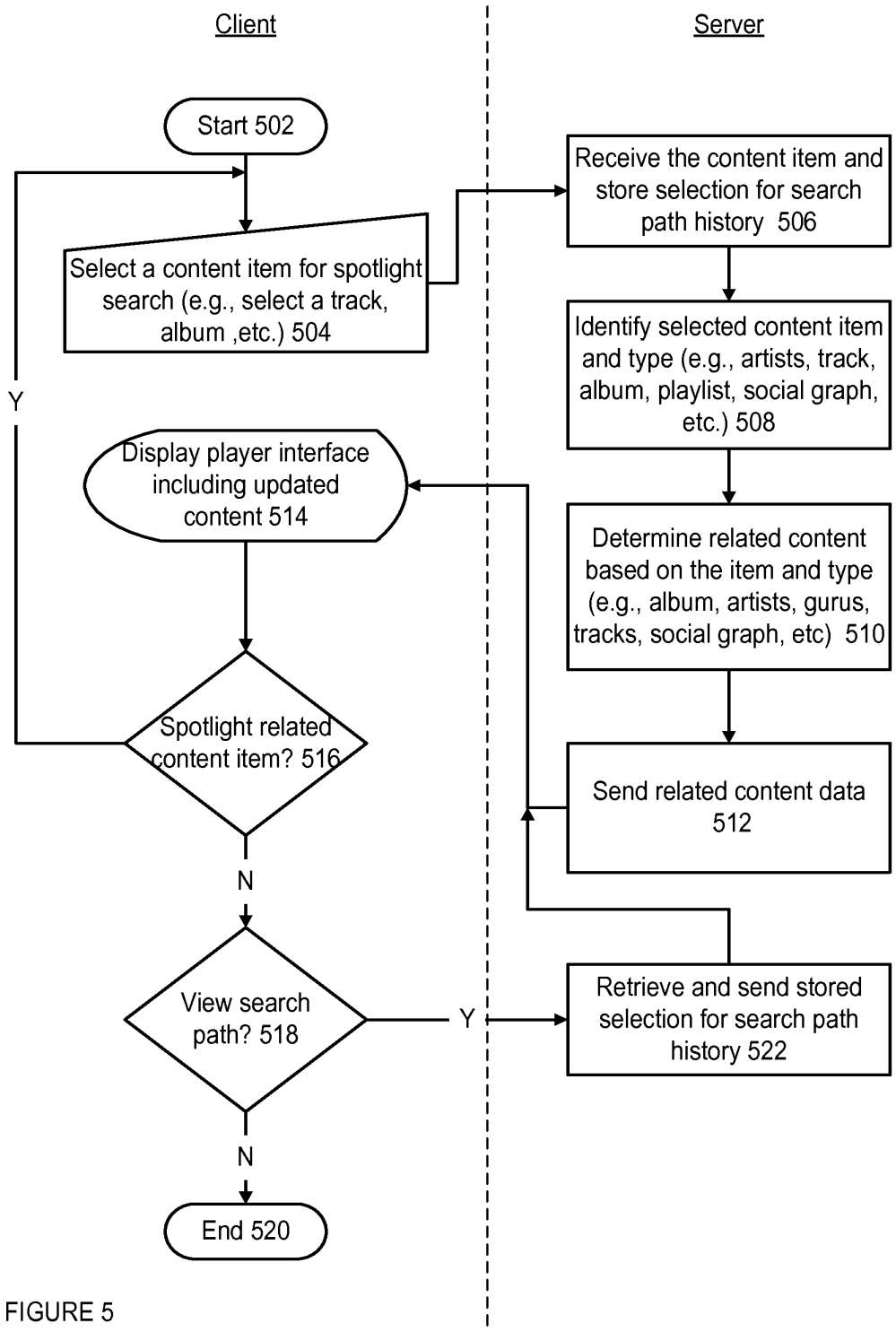

Client
Server
Start 502
Select a content item for spotlight search (e.g., select a track, album ,etc.) 504
Receive the content item and store selection for search path history 506
Identify selected content item and type (e.g., artists, track, album, playlist, social graph, etc.) 508
Determine related content based on the item and type (e.g., album, artists, gurus, tracks, social graph, etc) 510
Send related content data 512
Display player interface including updated content 514
Spotlight related content item? 516
Y
N
View search path? 518
Y
N
Retrieve and send stored selection for search path history 522
End 520

FIGURE 5

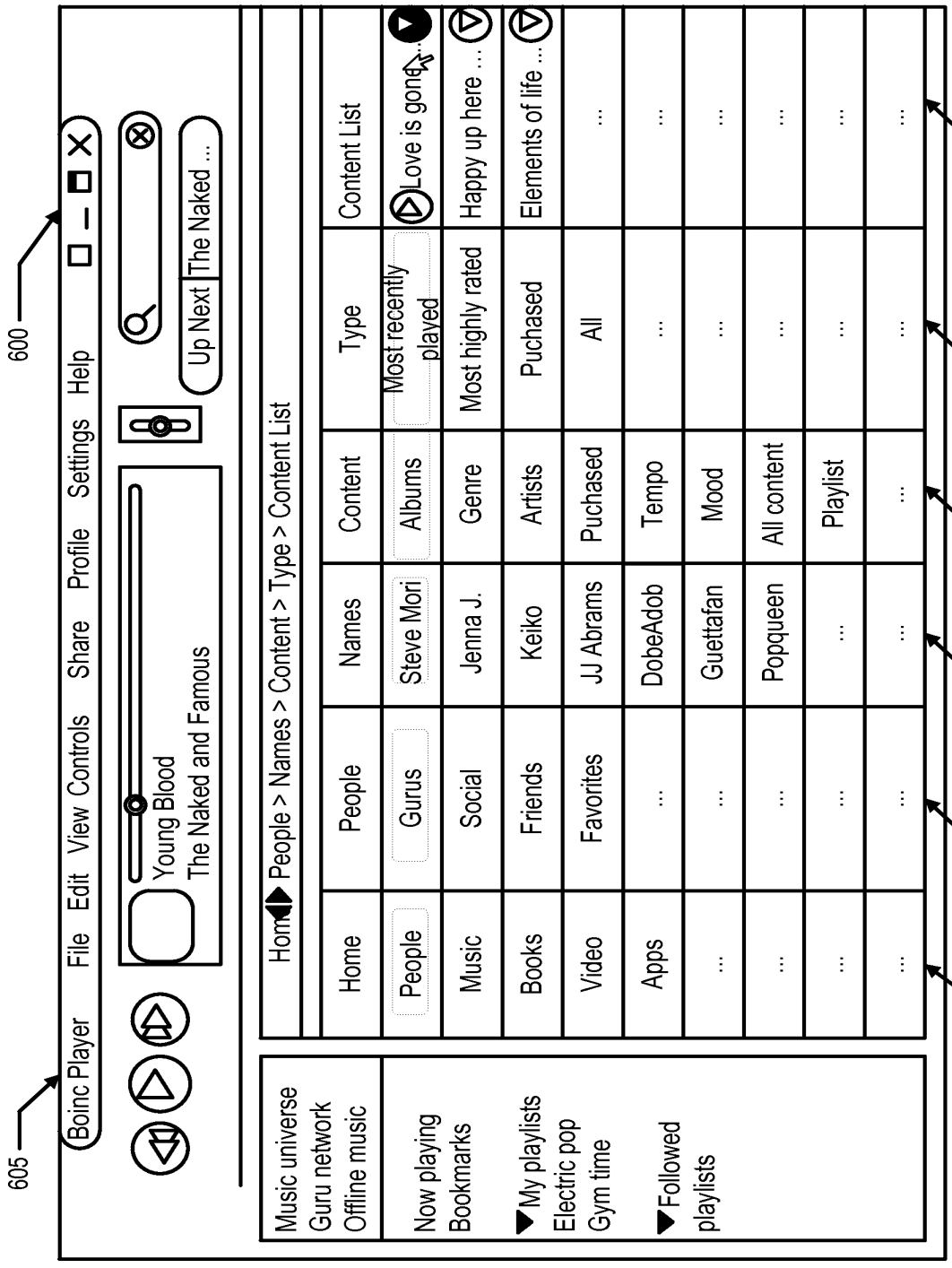

605
600
Boinc Player File Edit View Controls Share Profile Settings Help
Young Blood
The Naked and Famous
Up Next The Naked ...
Music universe
Guru network
Offline music
Now playing
Bookmarks
My playlists
Electric pop
Gym time
Followed playlists
Hom People > Names > Content > Type > Content List
Home
People
Music
Books
Video
Apps
Home
People
Gurus
Social
Friends
Favorites
...
People
Names
Steve Mori
Jenna J.
Keiko
JJ Abrams
DobeAdob
Guettafan
Popqueen
Content
Albums
Genre
Artists
Puchased
Tempo
Mood
All content
Playlist
Type
Most recently played
Most highly rated
Puchased
All
Content List
Love is gone...
Happy up here ...
Elements of life ...
610
612
614
616
618
620

FIGURE 6a

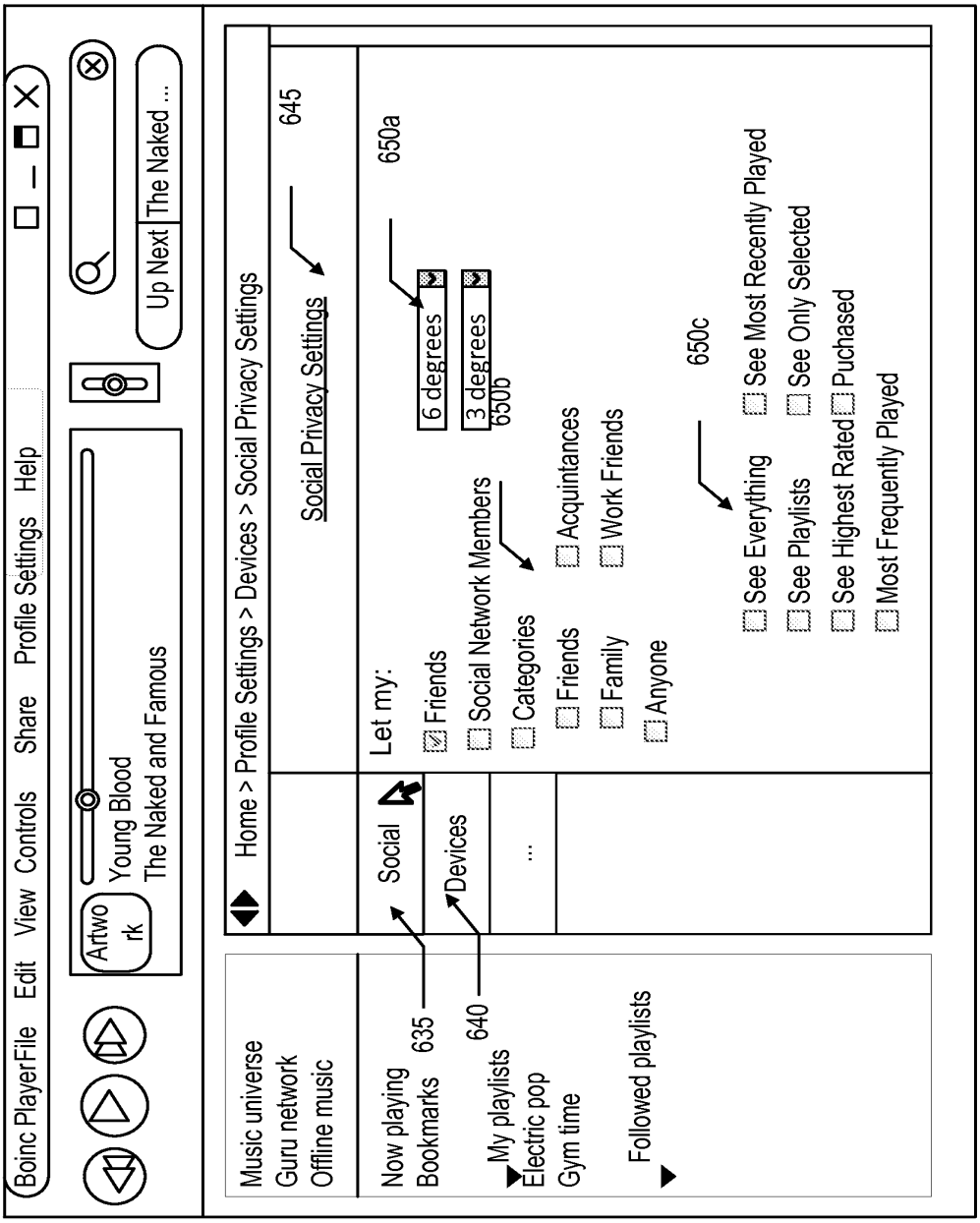

Boinc PlayerFile Edit View Controls Share Profile Settings Help
Artwo rk
Young Blood
The Naked and Famous
Up Next The Naked ...
Music universe
Guru network
Offline music
Now playing
Bookmarks
My playlists
Electric pop
Gym time
Followed playlists
635
640
Home > Profile Settings > Devices > Social Privacy Settings
Social Privacy Settings
645
Social
Devices
...
Let my:
650a
Friends
6 degrees
Social Network Members
3 degrees
650b
Categories
Friends
Acquintances
Family
Work Friends
Anyone
650c
See Everything
See Most Recently Played
See Playlists
See Only Selected
See Highest Rated
Puchased
Most Frequently Played

FIGURE 6b

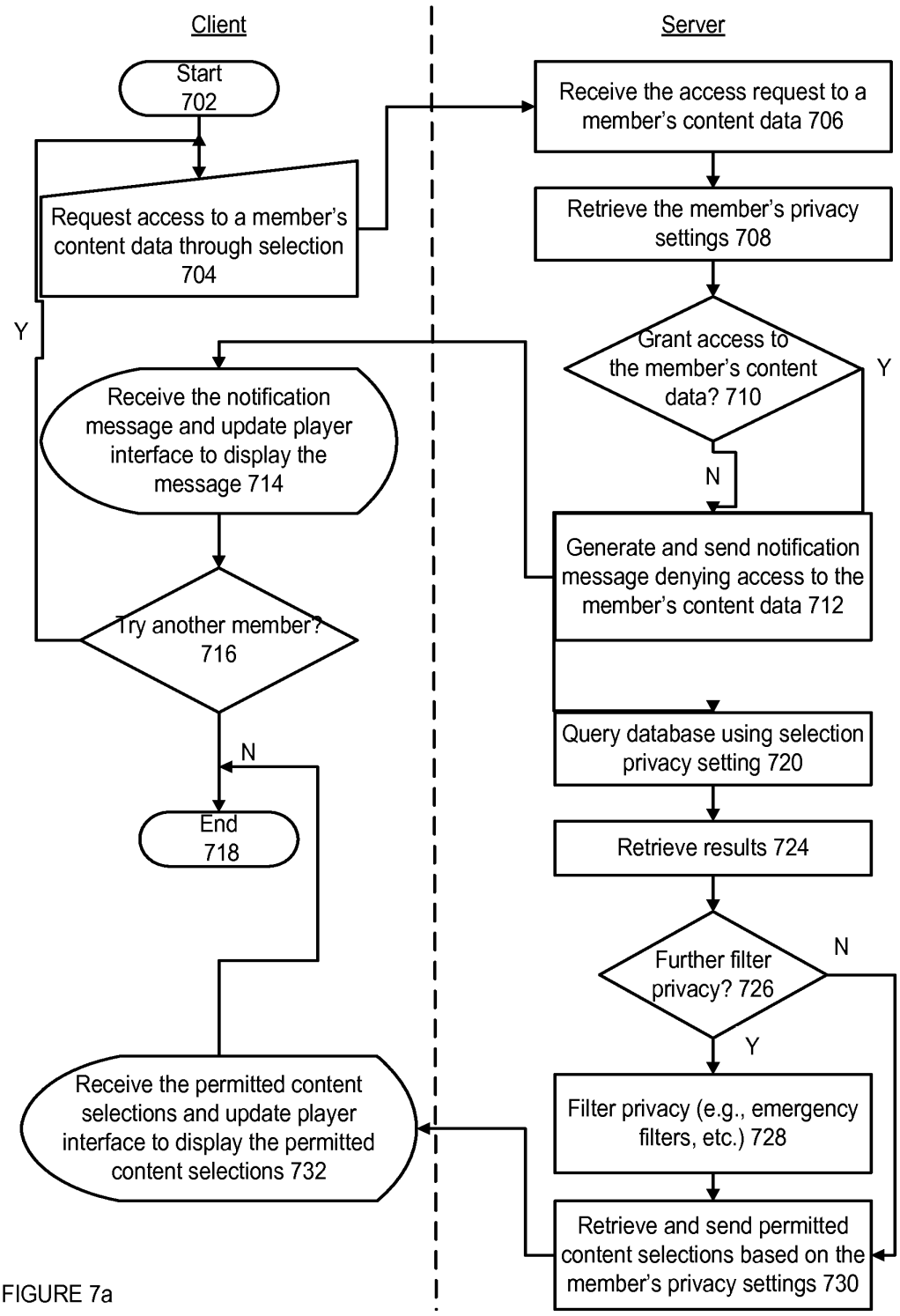

Client
Server
Start 702
Request access to a member's content data through selection 704
Receive the access request to a member's content data 706
Retrieve the member's privacy settings 708
Grant access to the member's content data? 710
Y
N
Generate and send notification message denying access to the member's content data 712
Query database using selection privacy setting 720
Retrieve results 724
Further filter privacy? 726
N
Y
Filter privacy (e.g., emergency filters, etc.) 728
Retrieve and send permitted content selections based on the member's privacy settings 730
Y
Receive the notification message and update player interface to display the message 714
Try another member? 716
N
End 718
Receive the permitted content selections and update player interface to display the permitted content selections 732

FIGURE 7a

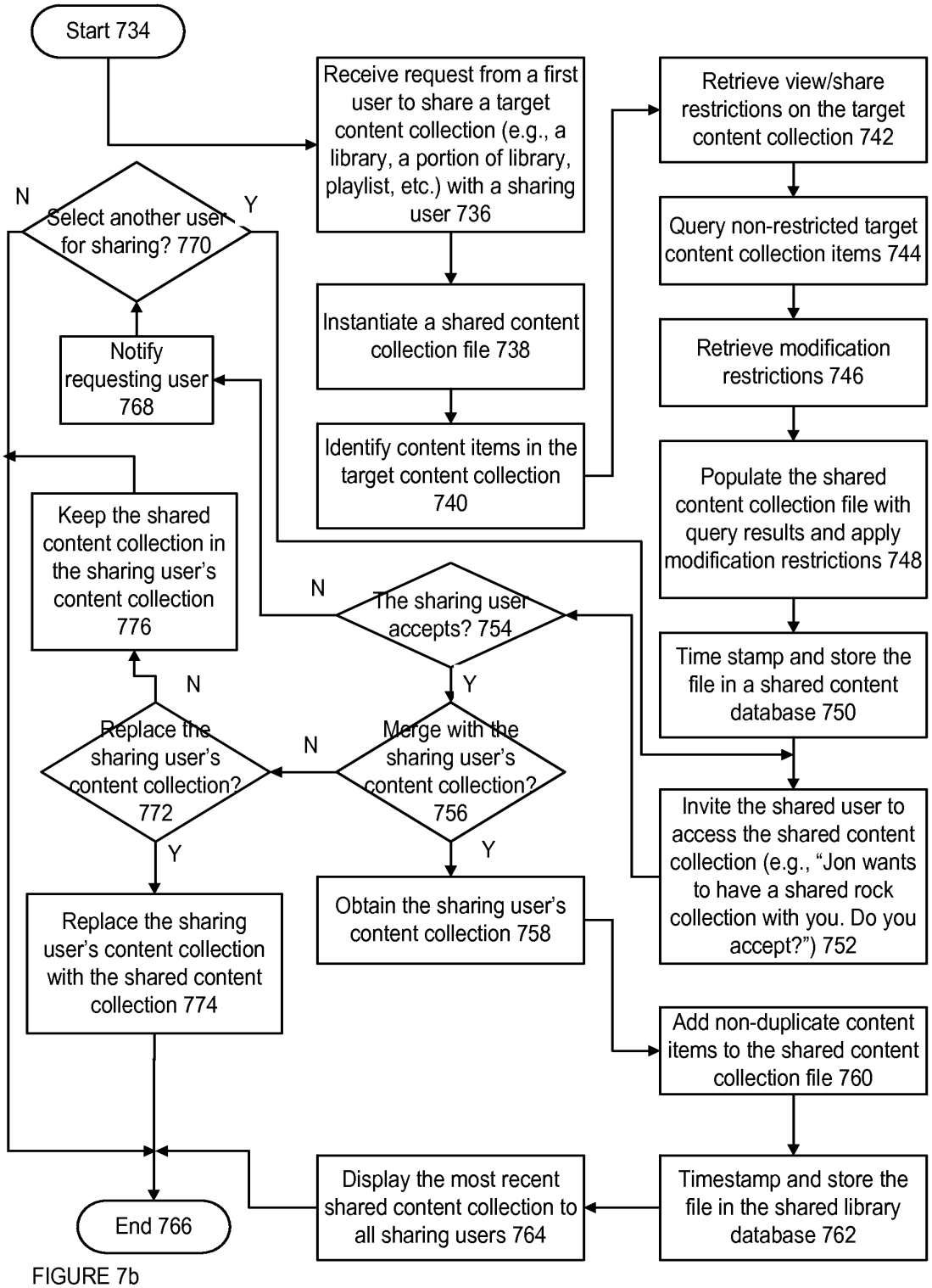

Start 734
Receive request from a first user to share a target content collection (e.g., a library, a portion of library, playlist, etc.) with a sharing user 736
Retrieve view/share restrictions on the target content collection 742
Query non-restricted target content collection items 744
Retrieve modification restrictions 746
Populate the shared content collection file with query results and apply modification restrictions 748
Time stamp and store the file in a shared content database 750
Invite the shared user to access the shared content collection (e.g., "Jon wants to have a shared rock collection with you. Do you accept?") 752
The sharing user accepts? 754
N
Y
Merge with the sharing user's content collection? 756
N
Y
Obtain the sharing user's content collection 758
Add non-duplicate content items to the shared content collection file 760
Timestamp and store the file in the shared library database 762
Display the most recent shared content collection to all sharing users 764
End 766
Instantiate a shared content collection file 738
Identify content items in the target content collection 740
Select another user for sharing? 770
N
Y
Notify requesting user 768
Keep the shared content collection in the sharing user's content collection 776
Replace the sharing user's content collection? 772
N
Y
Replace the sharing user's content collection with the shared content collection 774

FIGURE 7b

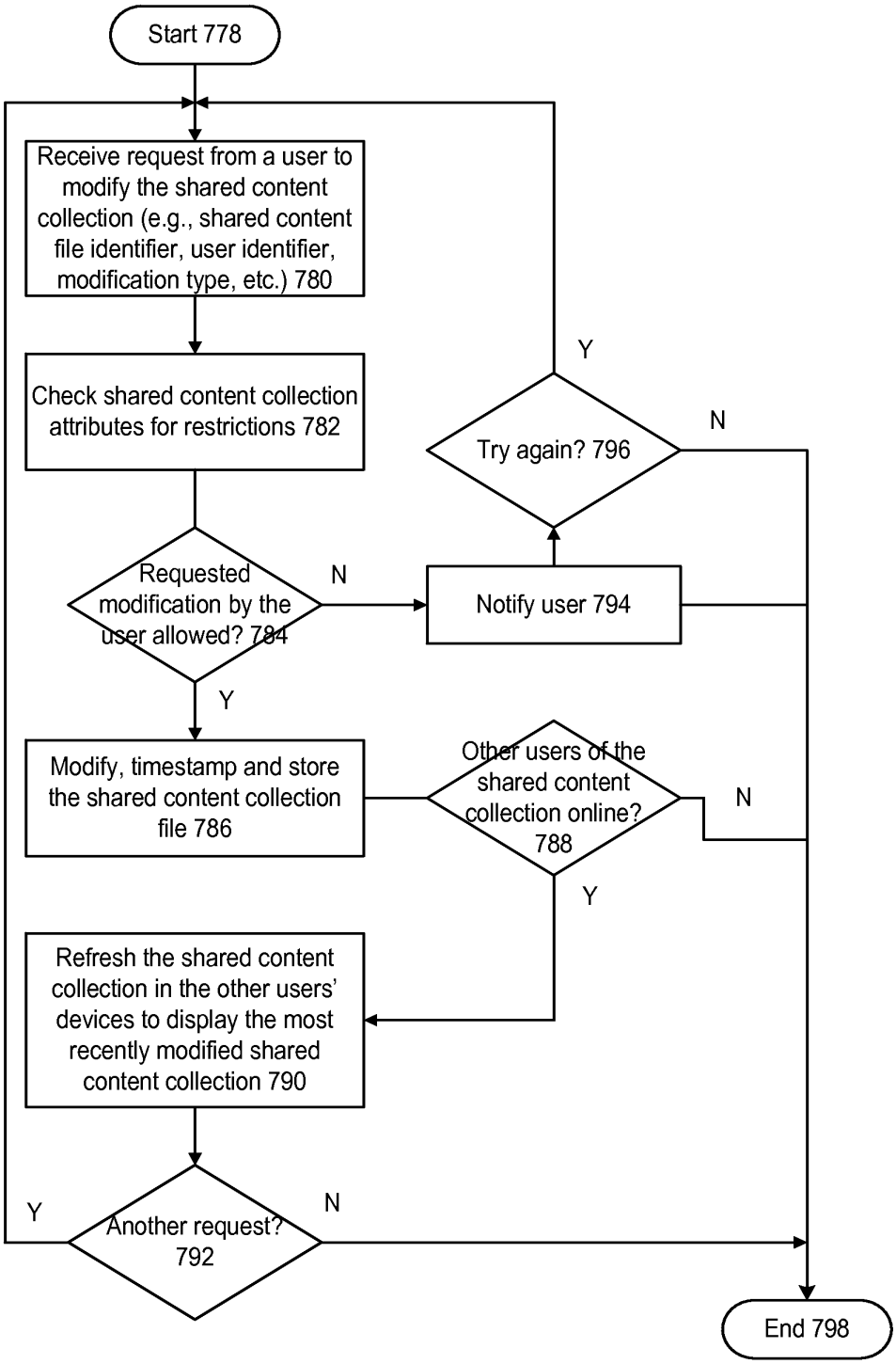

Start 778
Receive request from a user to modify the shared content collection (e.g., shared content file identifier, user identifier, modification type, etc.) 780
Check shared content collection attributes for restrictions 782
Requested modification by the user allowed? 784
N
Notify user 794
Try again? 796
Y
N
Y
Modify, timestamp and store the shared content collection file 786
Other users of the shared content collection online? 788
N
Y
Refresh the shared content collection in the other users' devices to display the most recently modified shared content collection 790
Another request? 792
Y
N
End 798

FIGURE 7c

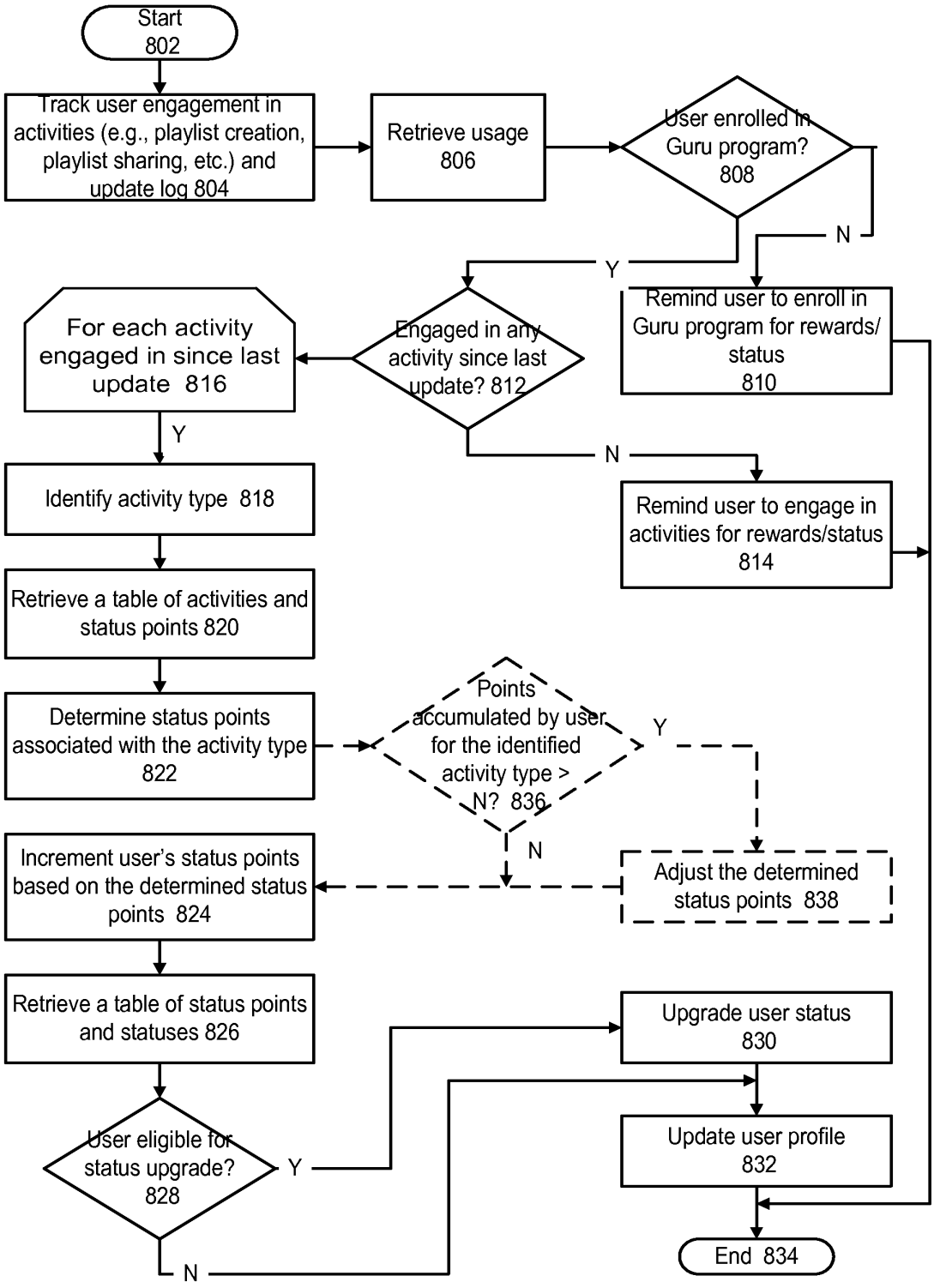

Start 802
Track user engagement in activities (e.g., playlist creation, playlist sharing, etc.) and update log 804
Retrieve usage 806
User enrolled in Guru program? 808
N
Y
Remind user to enroll in Guru program for rewards/ status 810
Engaged in any activity since last update? 812
For each activity engaged in since last update 816
Y
N
Identify activity type 818
Remind user to engage in activities for rewards/status 814
Retrieve a table of activities and status points 820
Determine status points associated with the activity type 822
Points accumulated by user for the identified activity type > N? 836
Y
N
Increment user's status points based on the determined status points 824
Adjust the determined status points 838
Retrieve a table of status points and statuses 826
Upgrade user status 830
User eligible for status upgrade? 828
Y
N
Update user profile 832
End 834

FIGURE 8a

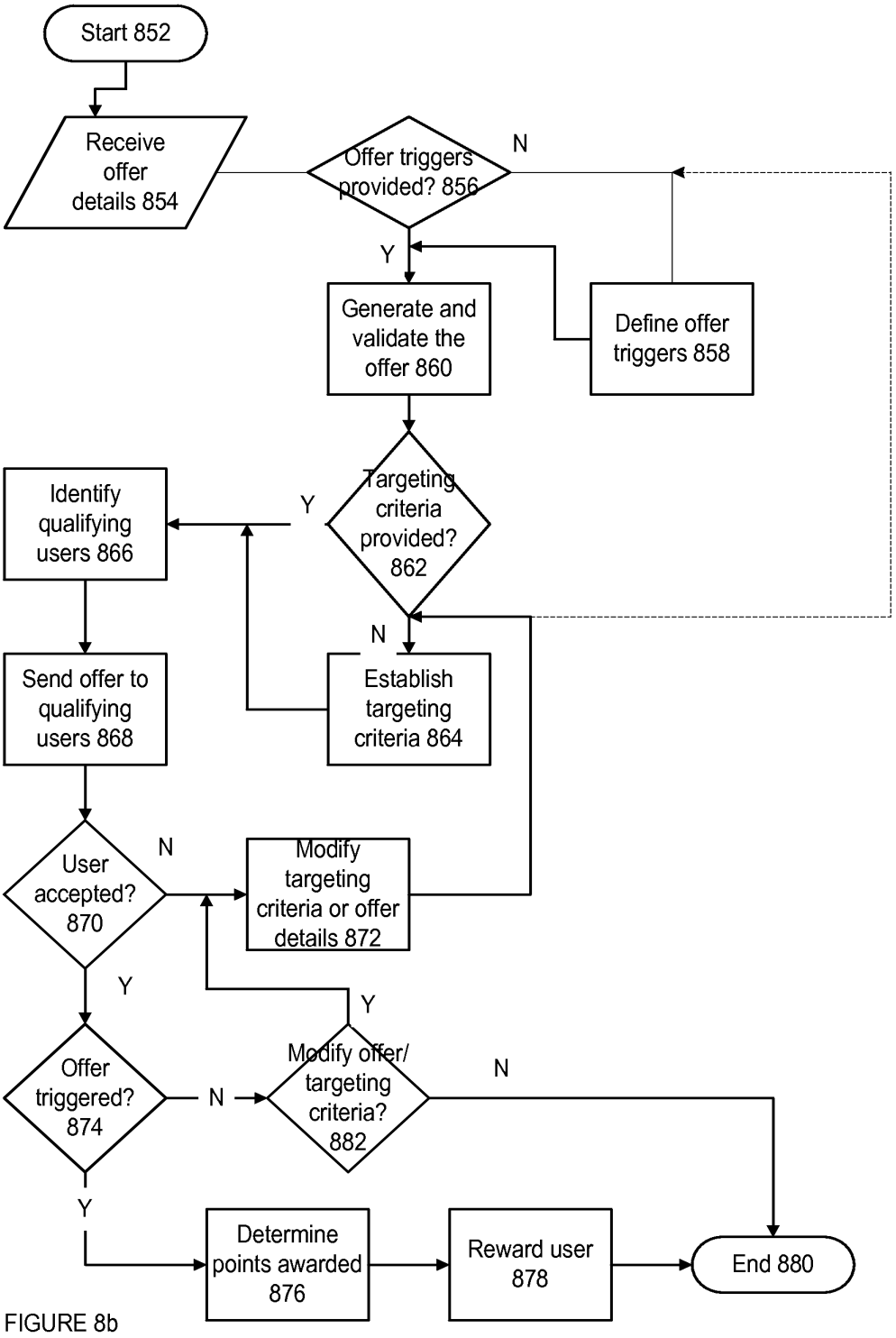

Start 852
Receive offer details 854
Offer triggers provided? 856
N
Y
Generate and validate the offer 860
Define offer triggers 858
Targeting criteria provided? 862
Y
Identify qualifying users 866
N
Establish targeting criteria 864
Send offer to qualifying users 868
User accepted? 870
N
Modify targeting criteria or offer details 872
Y
Y
Offer triggered? 874
N
Modify offer/ targeting criteria? 882
N
Y
Determine points awarded 876
Reward user 878
End 880

FIGURE 8b

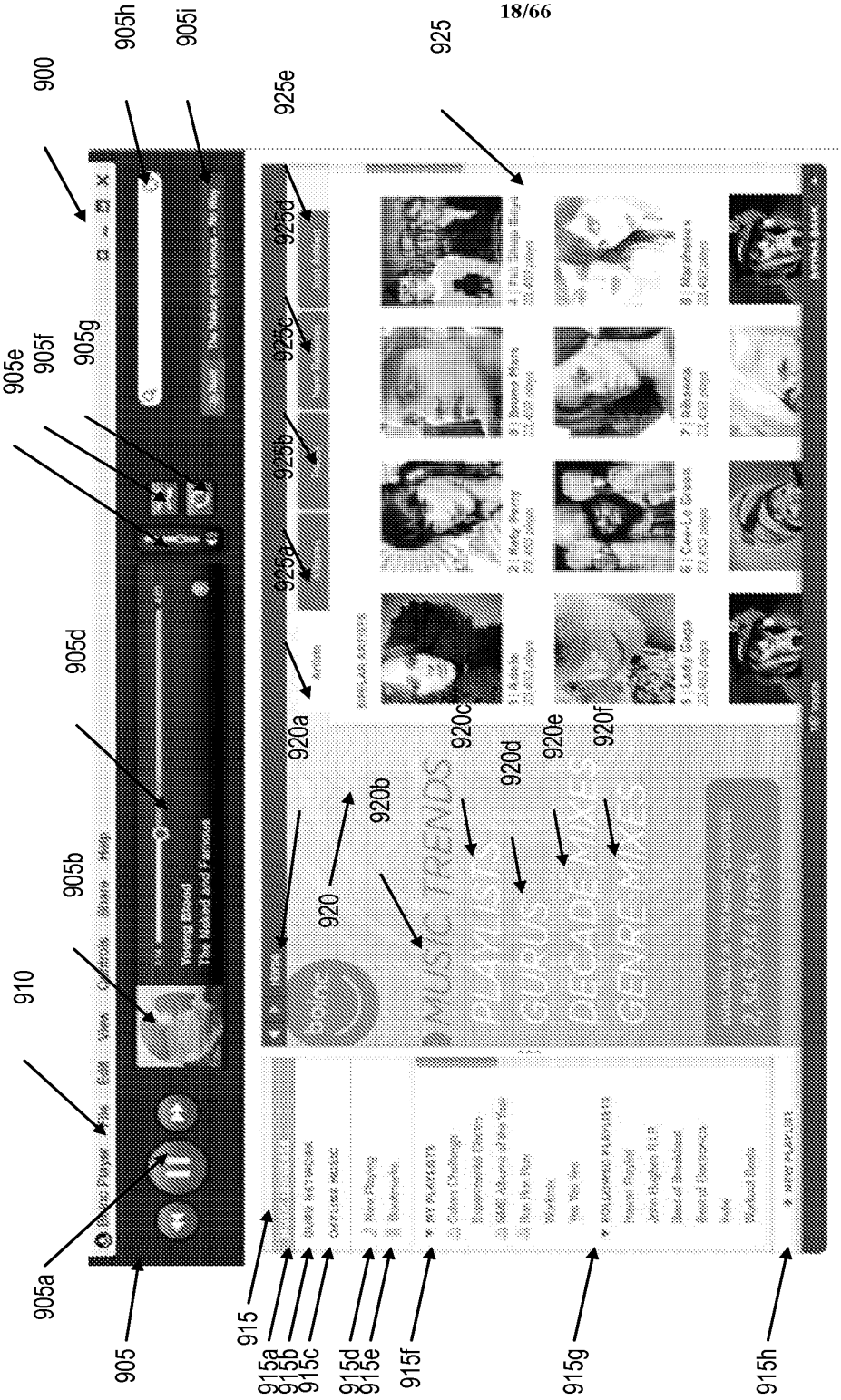

900
905h
905i
925
925e
905e
905f
905g
925d
925c
925b
925a
905d
905b
910
920a
920
920b
920c
920d
920e
920f
905a
905
915
915a
915b
915c
915d
915e
915f
915g
915h

FIGURE 9

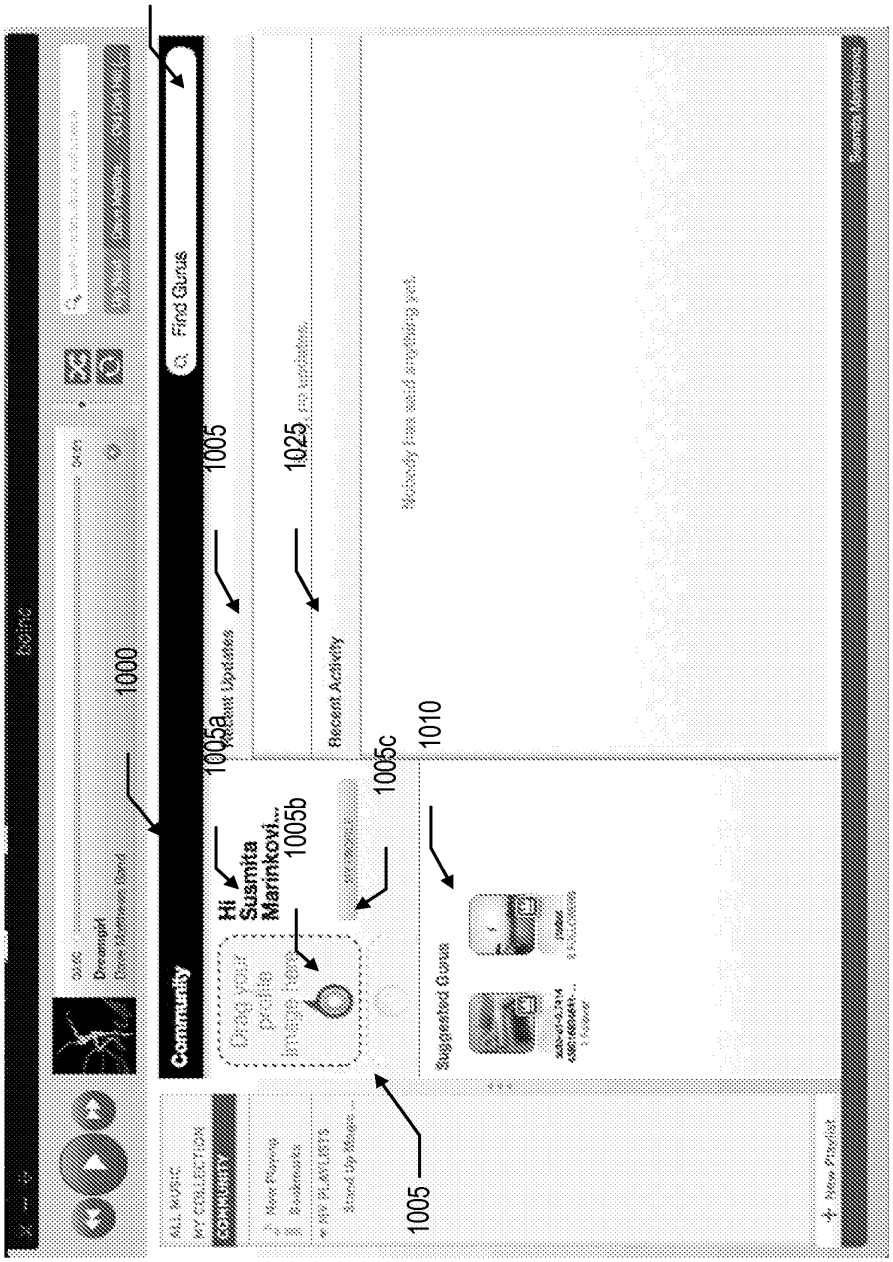

1020
1000
1005
1005a
1005b
1005c
1010
1025
Community
Find Gurus
Hi Susmita Marinkovi...
Drag your profile image here
Recent Activity
Suggested Gurus
1005

FIGURE 10

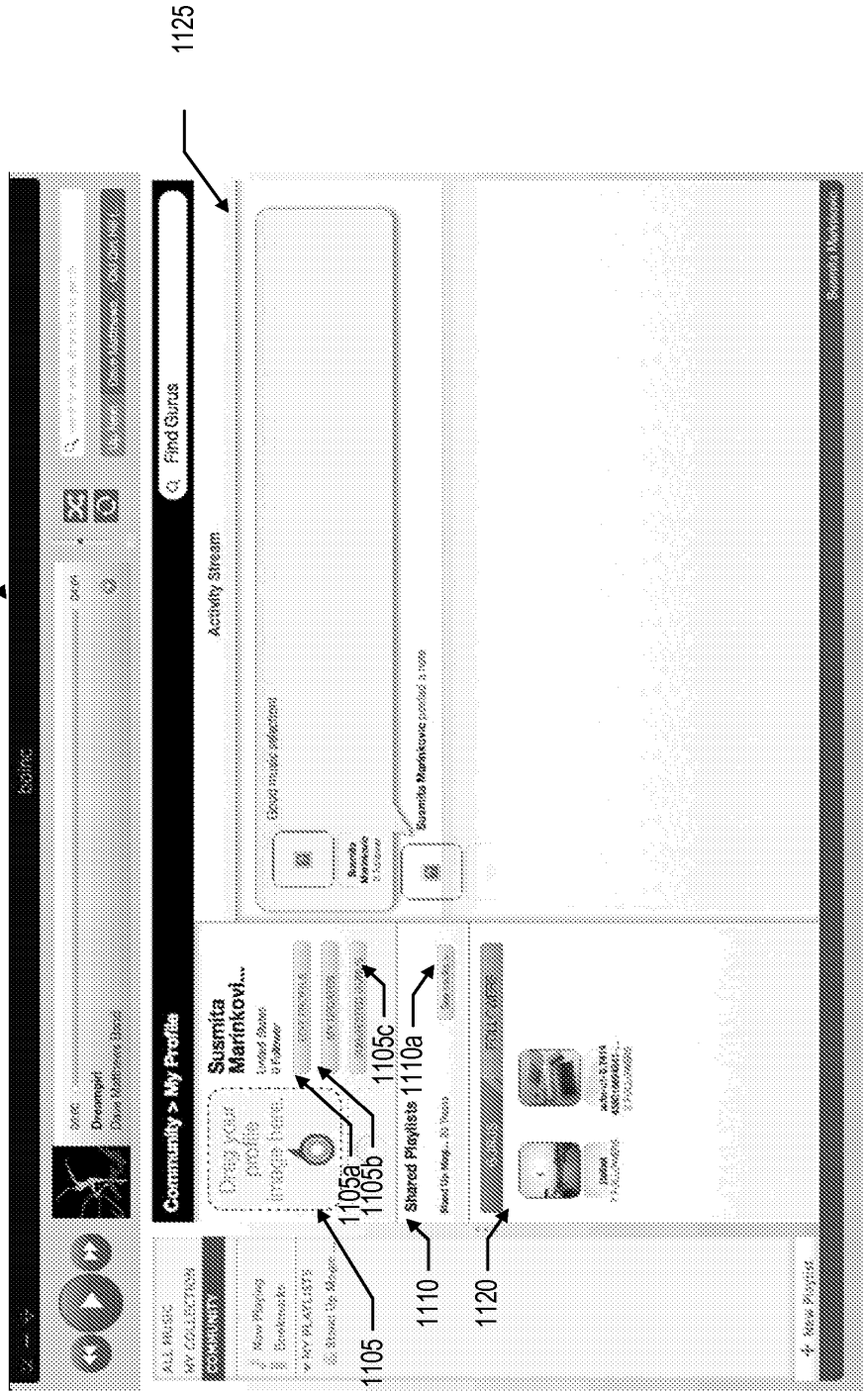

1100
1125
Community > My Profile
Find Gurus
Activity Stream
Susmita Marinkovi...
Drag your profile image here
Shared Playlists
1105
1105a
1105b
1105c
1110
1110a
1120

FIGURE 11a

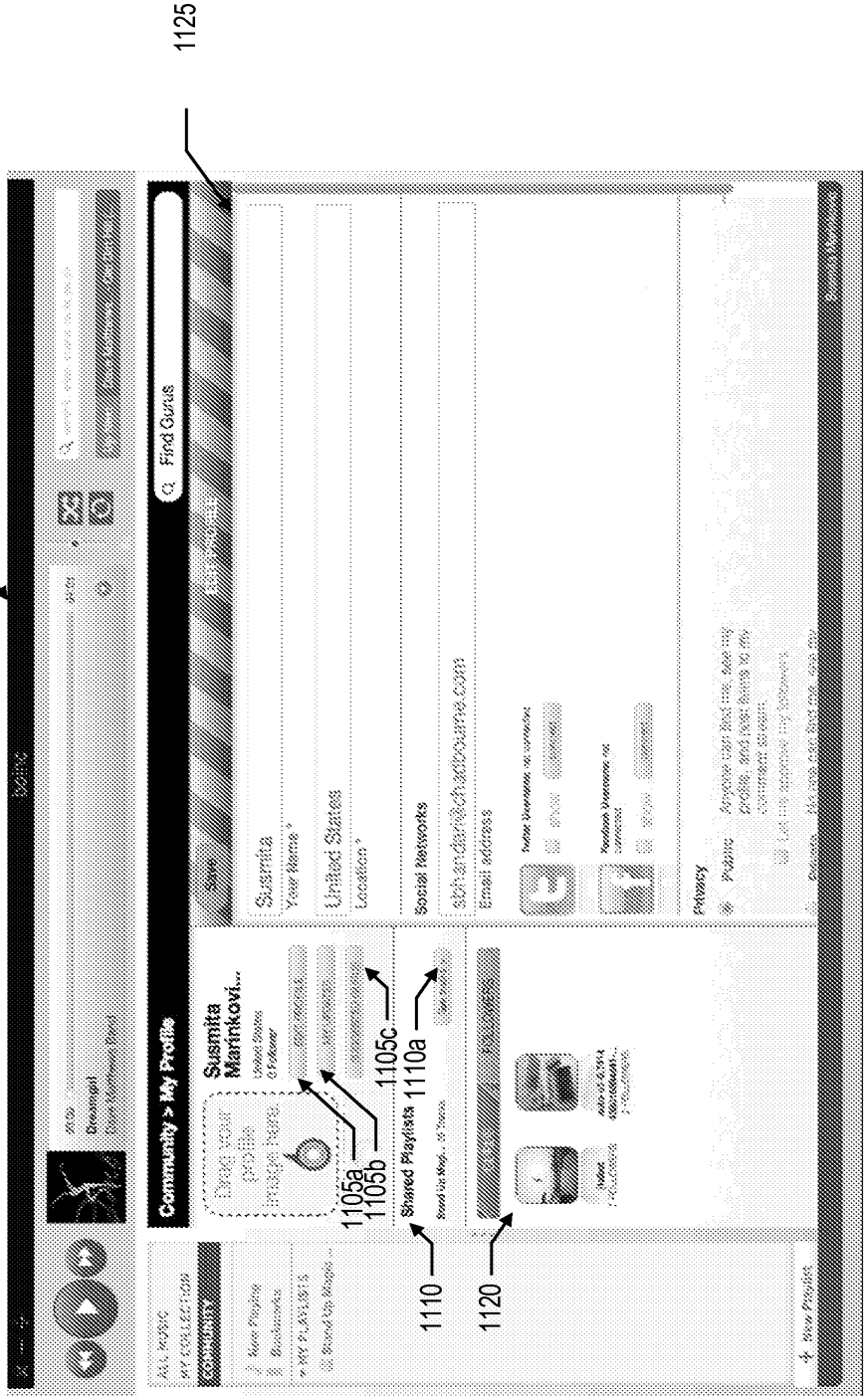

1100
1125
Community > My Profile
Find Gurus
Susmita
United States
Social Networks
Email address
Privacy
Drag your profile image here
Susmita Marinkovi...
1105a
1105b
1105c
1110a
1110
1120

FIGURE 11b

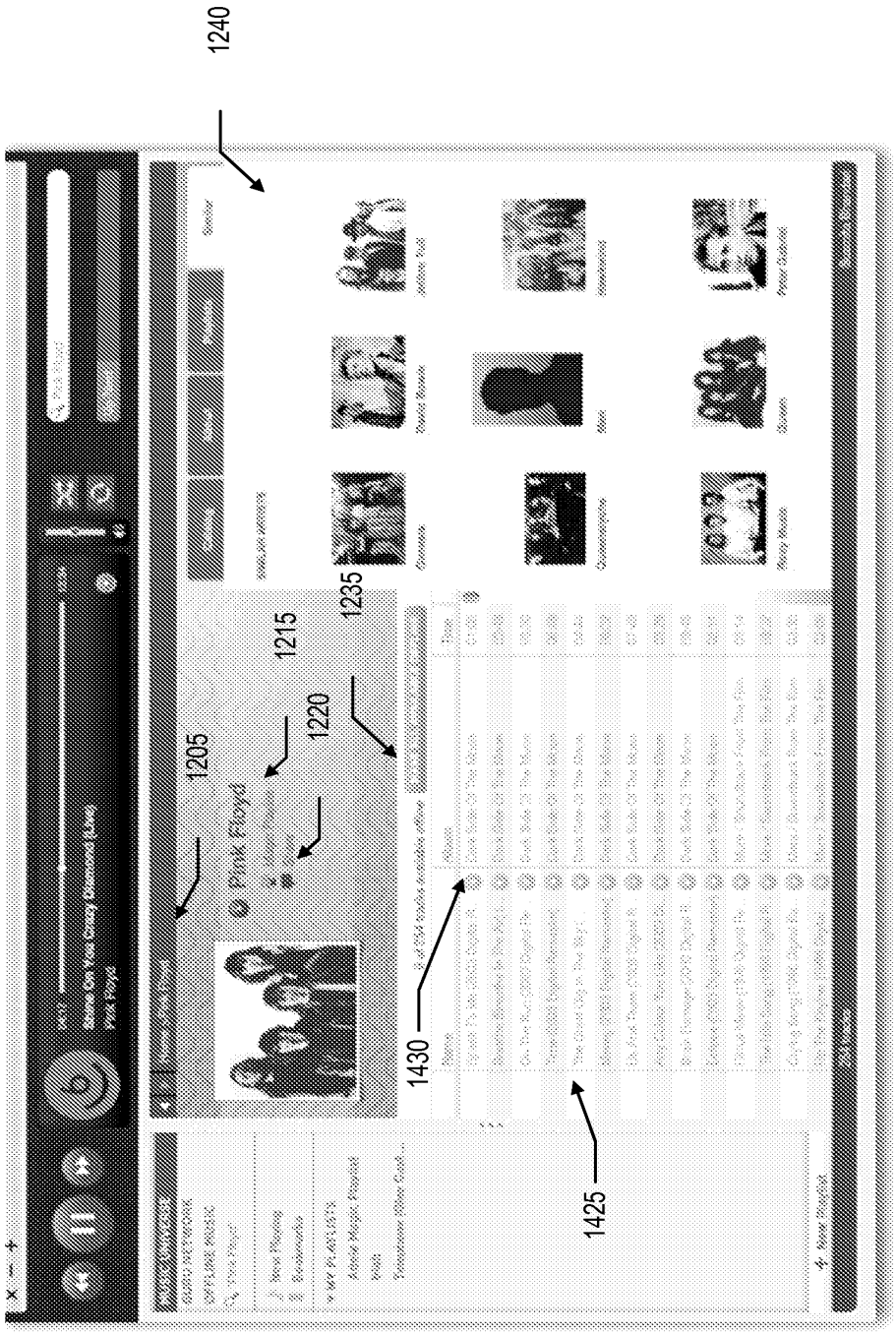



FIGURE 12a




FIGURE 12b

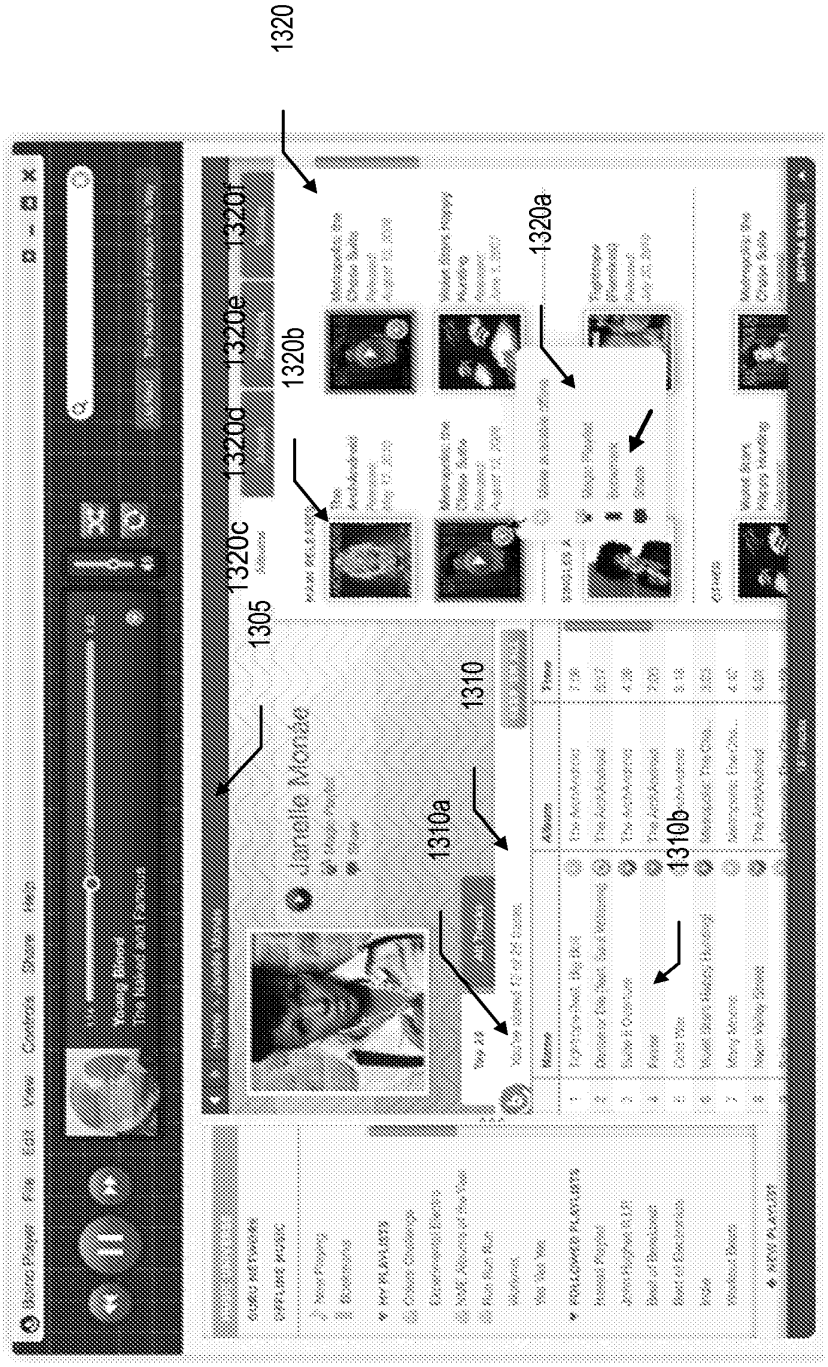

1320
1320f
1320e
1320d
1320c
1320b
1320a
1305
1310
1310a
1310b

FIGURE 13a




FIGURE 13b

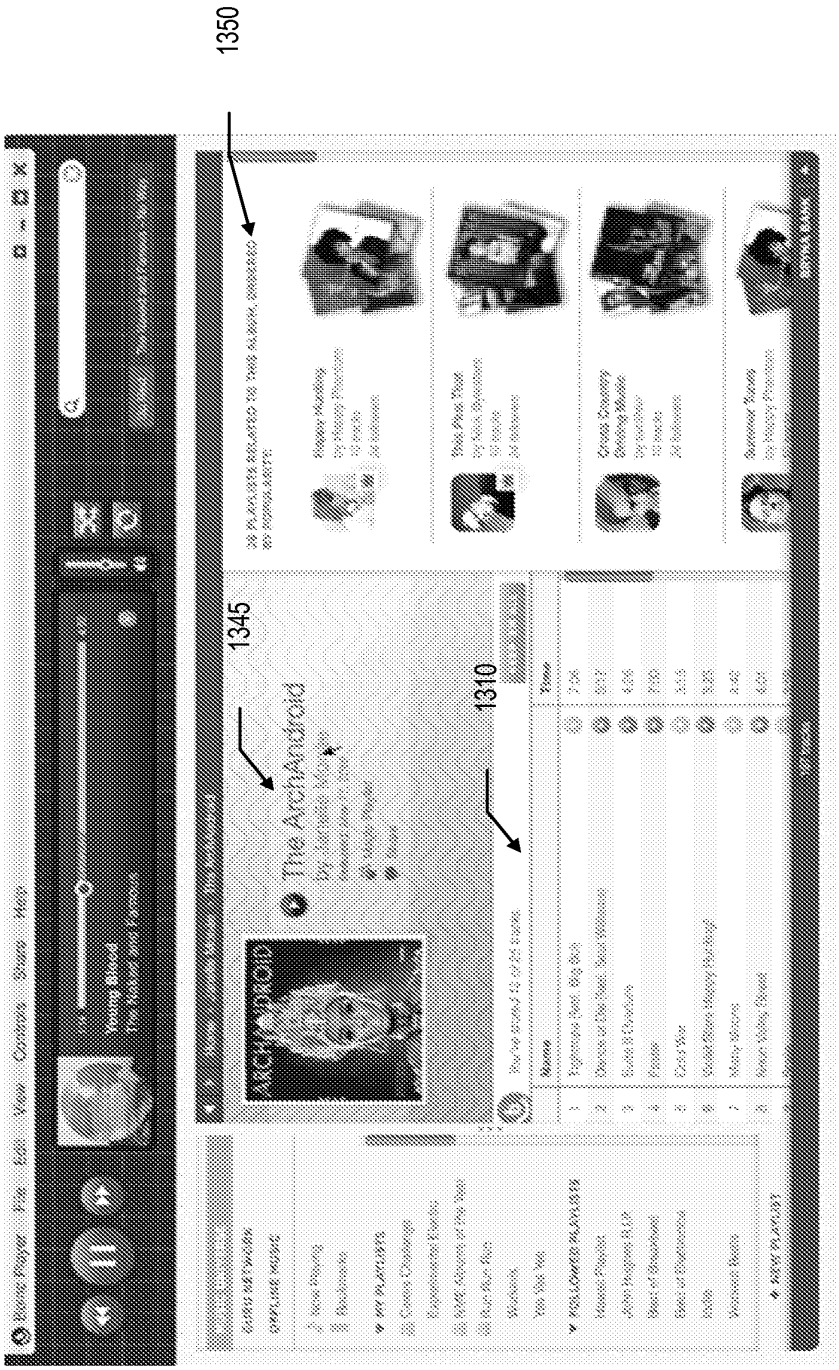



FIGURE 13c

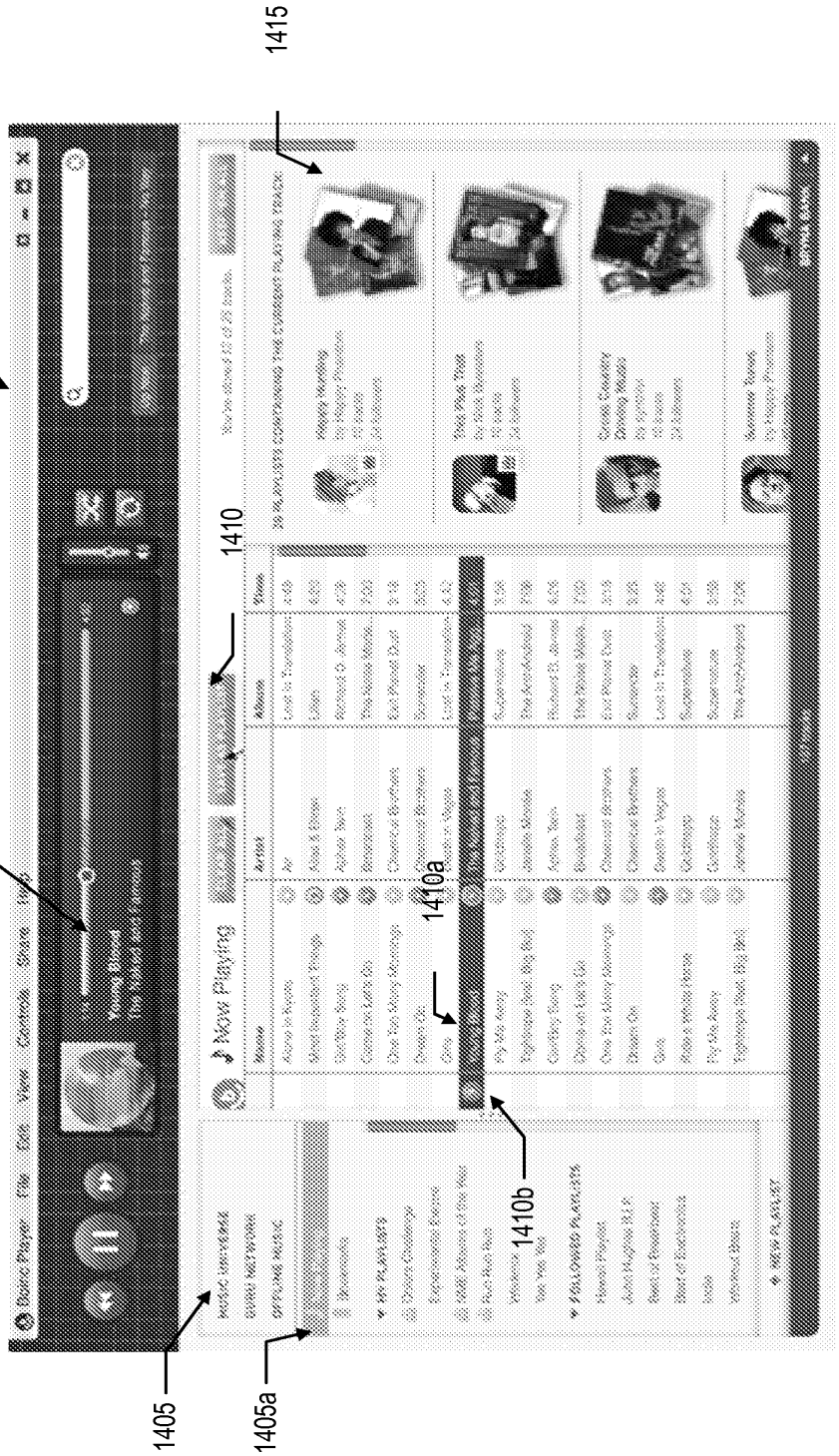



FIGURE 14

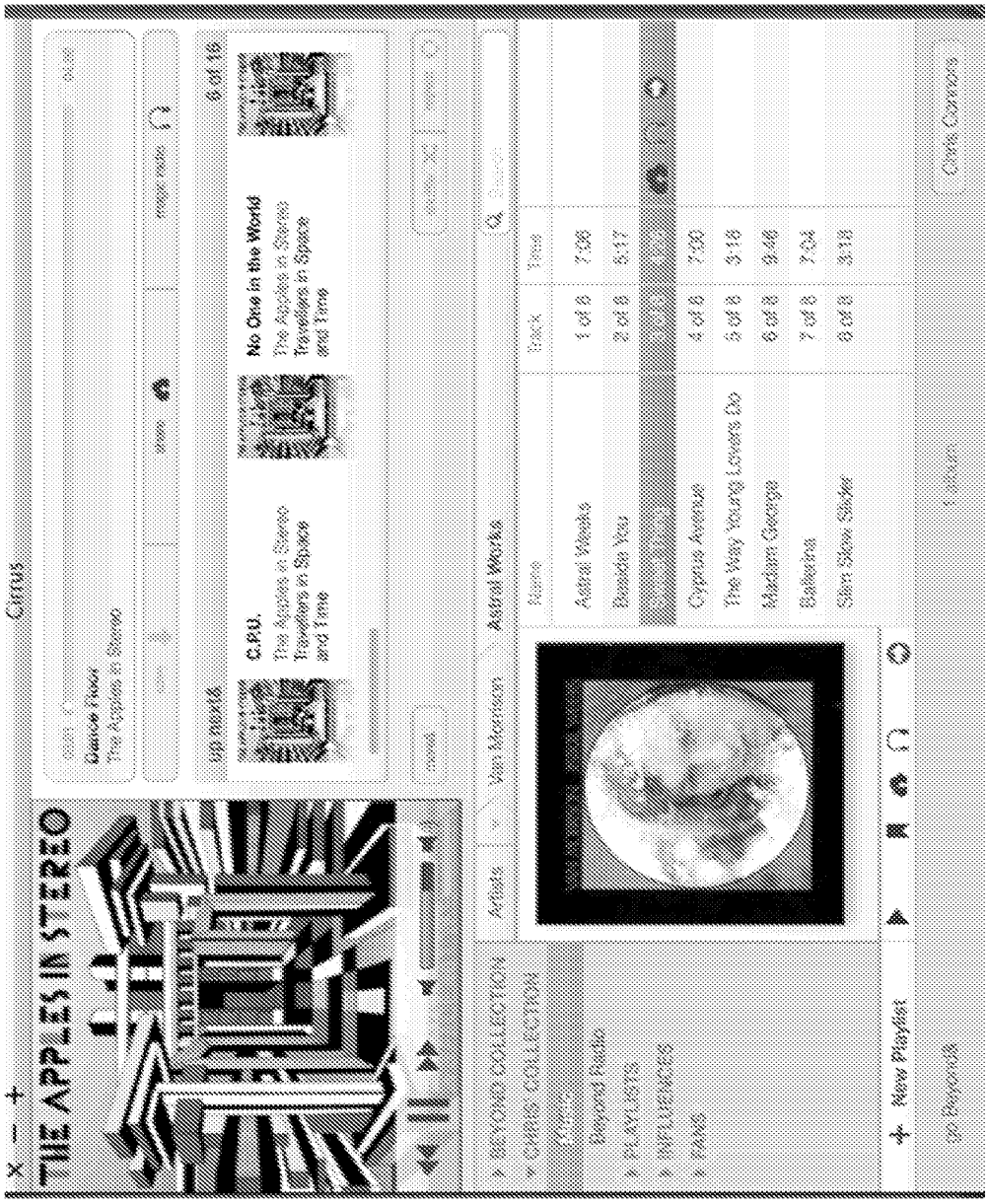

Circus
THE APPLES IN STEREO
Astral Weeks
Van Morrison
Astral Weeks
Name
Track
Time
Astral Weeks
1 of 8
7:08
Beside You
2 of 8
6:17
Cypress Avenue
4 of 8
7:00
The Way Young Lovers Do
5 of 8
3:18
Madam George
6 of 8
8:48
Ballerina
7 of 8
7:04
Slim Slow Slider
8 of 8
3:18
New Playlist
Clear Queue

FIGURE 15a

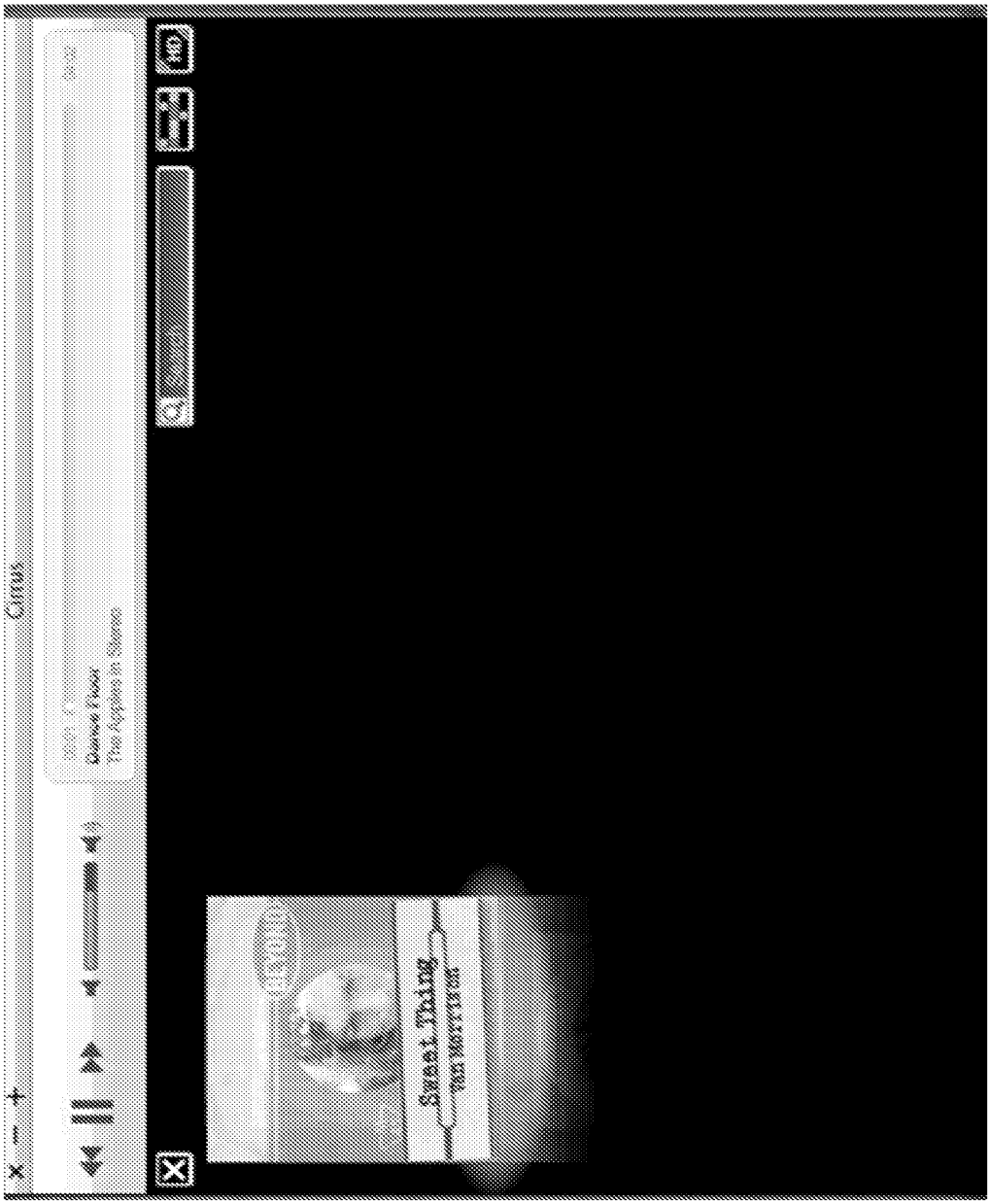



FIGURE 15b

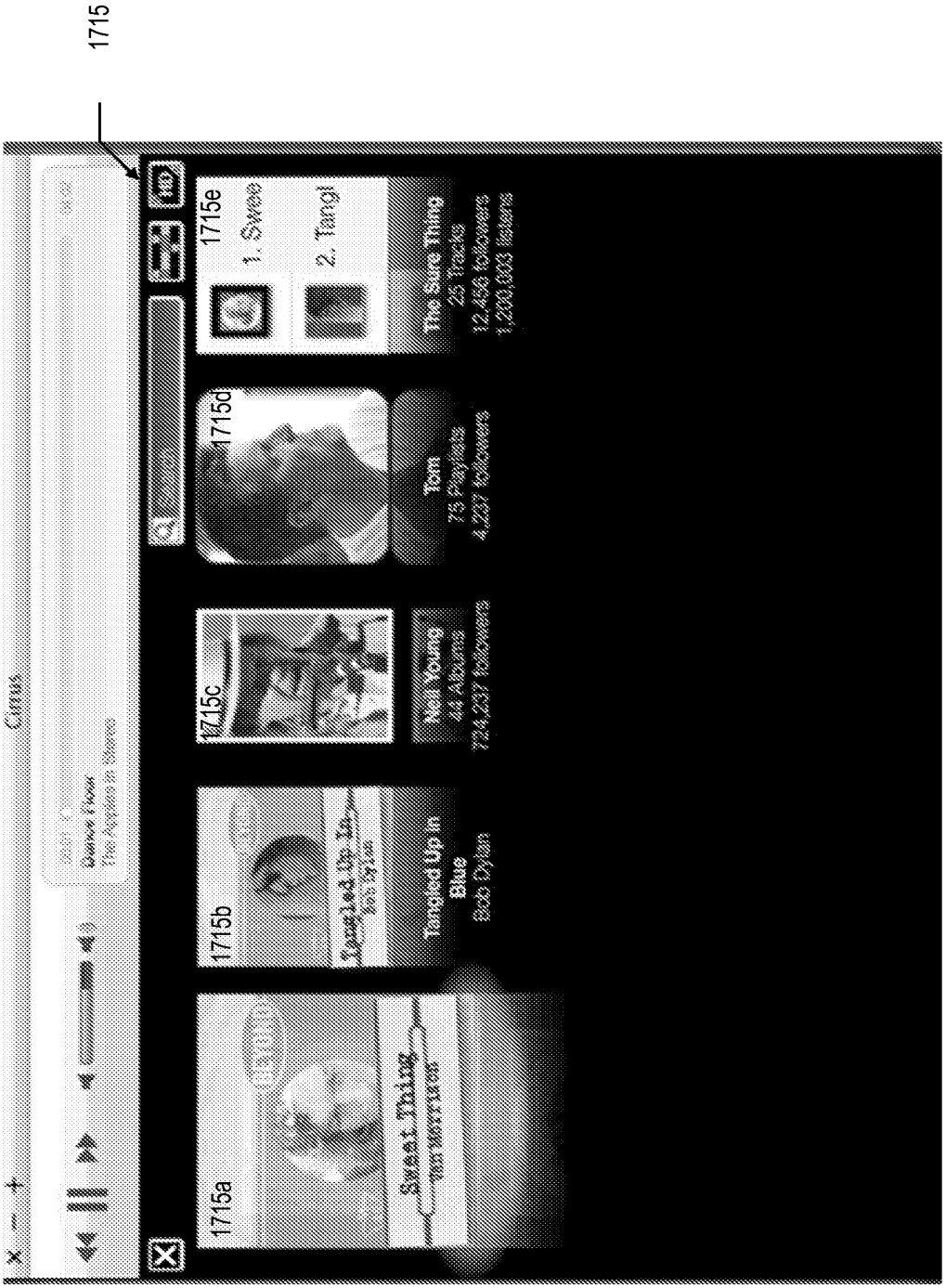

1715
1715a
1715b
1715c
1715d
1715e
Tangled Up In Blue
Bob Dylan
Neil Young
44 Albums
724,237 followers
Tom
75 Playlists
4,237 followers
The Sure Thing
25 Tracks
12,456 followers
1,200,803 listens
1. Swee
2. Tangl

FIGURE 15c

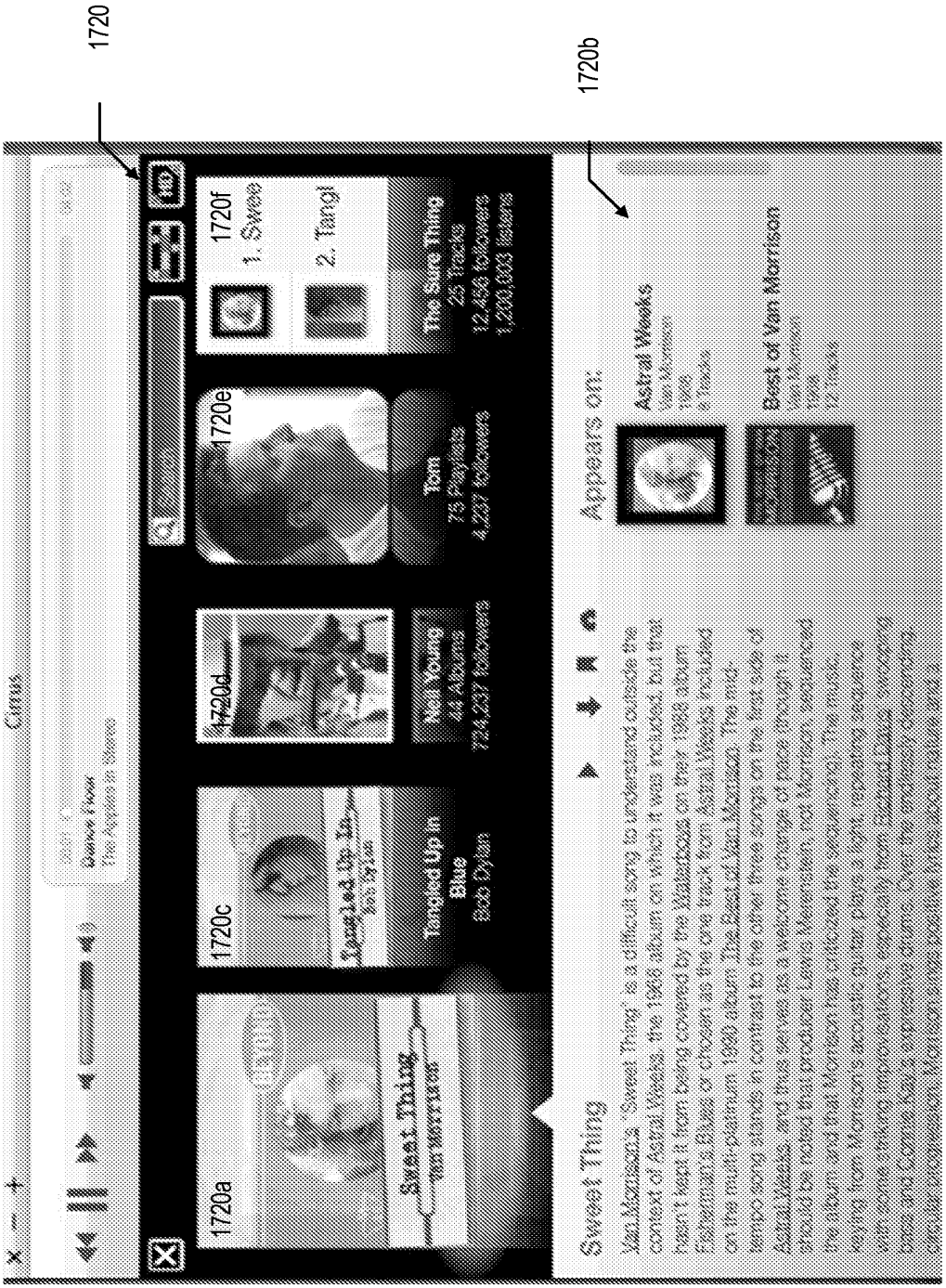

1720
1720b
1720a
1720c
1720d
1720e
1720f
Sweet Thing
Van Morrison
Tangled Up In Blue
Bob Dylan
Neil Young
44 Albums
724,537 followers
Tom
75 Playlists
4,237 followers
The Sure Thing
23 Tracks
12,454 followers
1,200,803 listens
Appears on:
Astral Weeks
Best of Van Morrison

FIGURE 15d

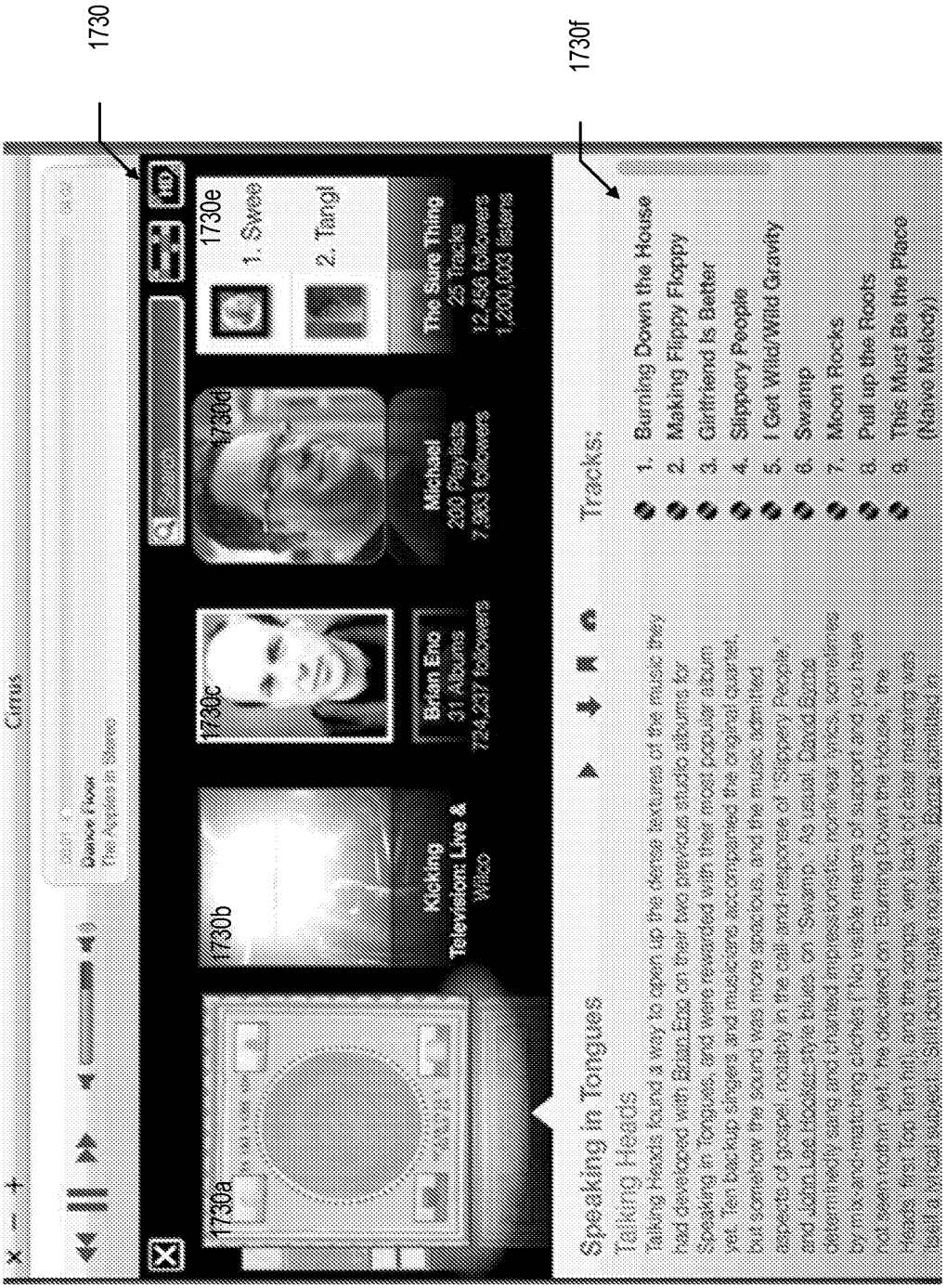

1730
1730f
1730a
1730b
1730c
1730d
1730e
Kicking Television Live @ Wilco
Brian Eno 31 Albums 724,537 followers
Michael 230 Playlists 7,533 followers
The Sure Thing 23 Tracks 12,454 followers 1,200,803 listens
1. Swee
2. Tangl
Speaking in Tongues
Talking Heads
Tracks:
1. Burning Down the House
2. Making Flippy Floppy
3. Girlfriend Is Better
4. Slippery People
5. I Get Wild/Wild Gravity
6. Swamp
7. Moon Rocks
8. Pull up the Roots
9. This Must Be the Place (Naive Melody)

FIGURE 15e

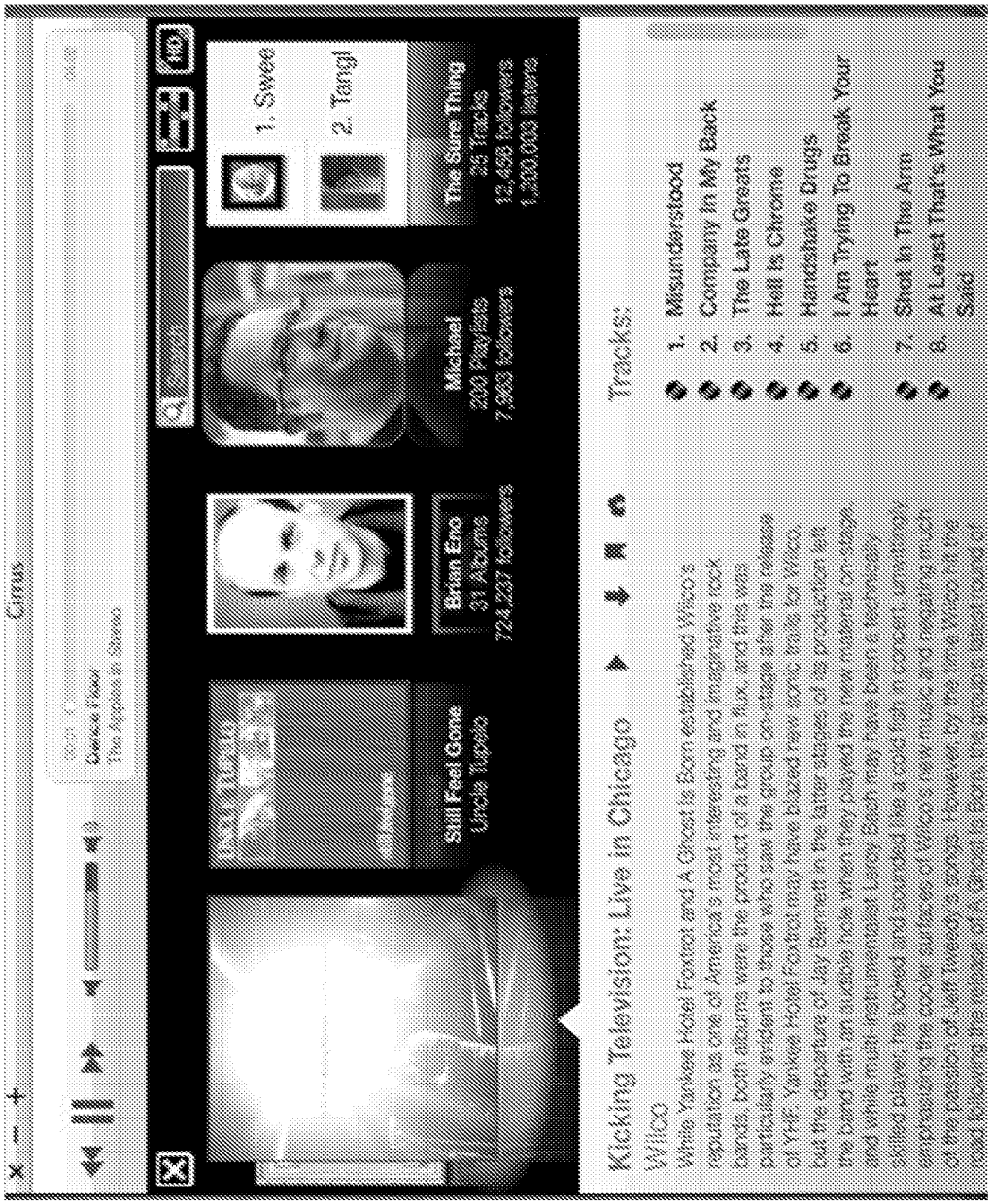

Cirrus
Still Feel Gone
Uncle Tupelo
Brian Eno
31 Albums
724,237 followers
Michael
230 Playlists
7,933 followers
The Sure Thing
25 Tracks
12,456 followers
1,230,800 listens
1. Swee
2. Tangl
Kicking Television: Live in Chicago
Wilco
Tracks:
1. Misunderstood
2. Company In My Back
3. The Late Greats
4. Hell Is Chrome
5. Handshake Drugs
6. I Am Trying To Break Your Heart
7. Shot In The Arm
8. At Least That's What You Said

FIGURE 15f

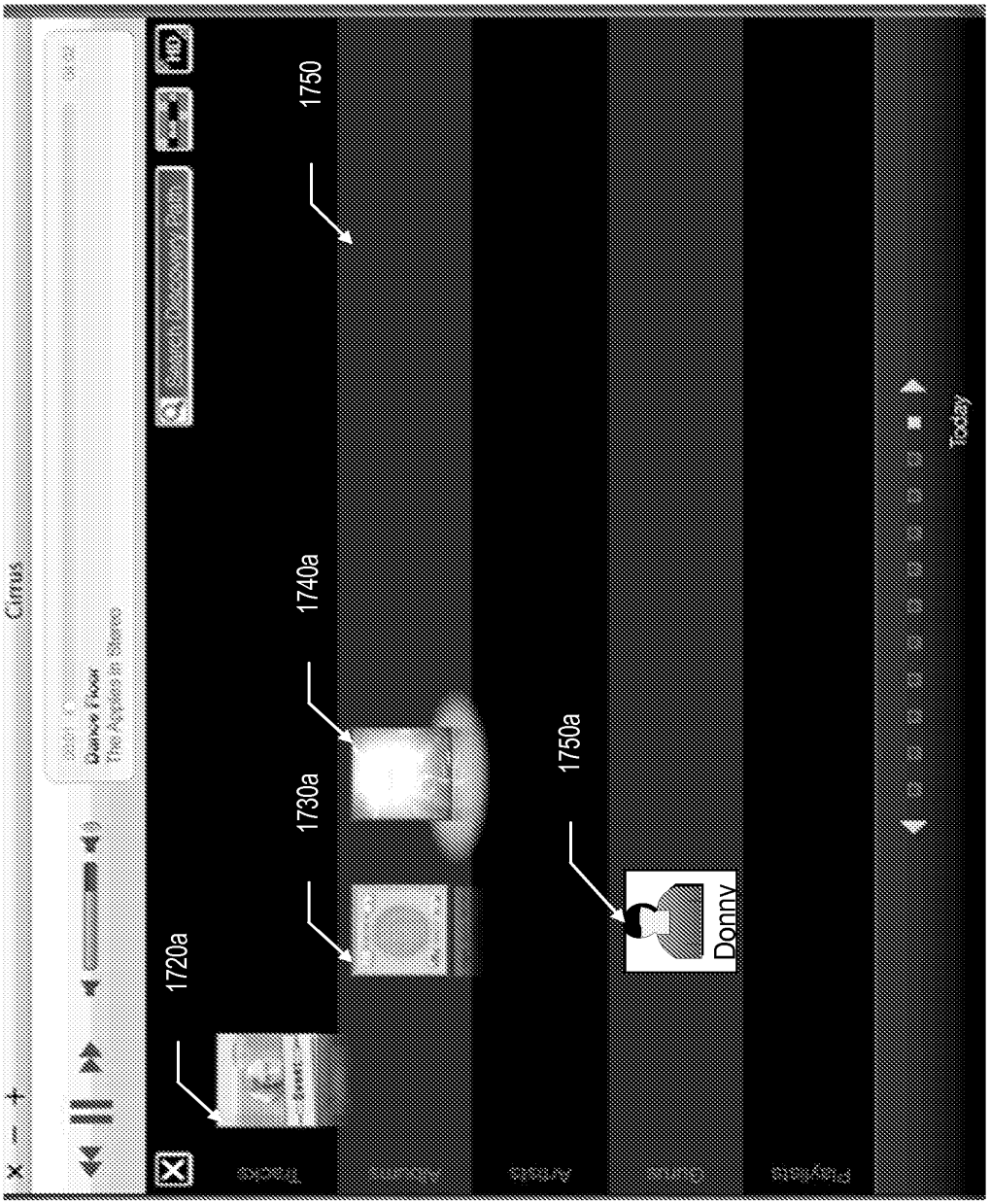



FIGURE 15g

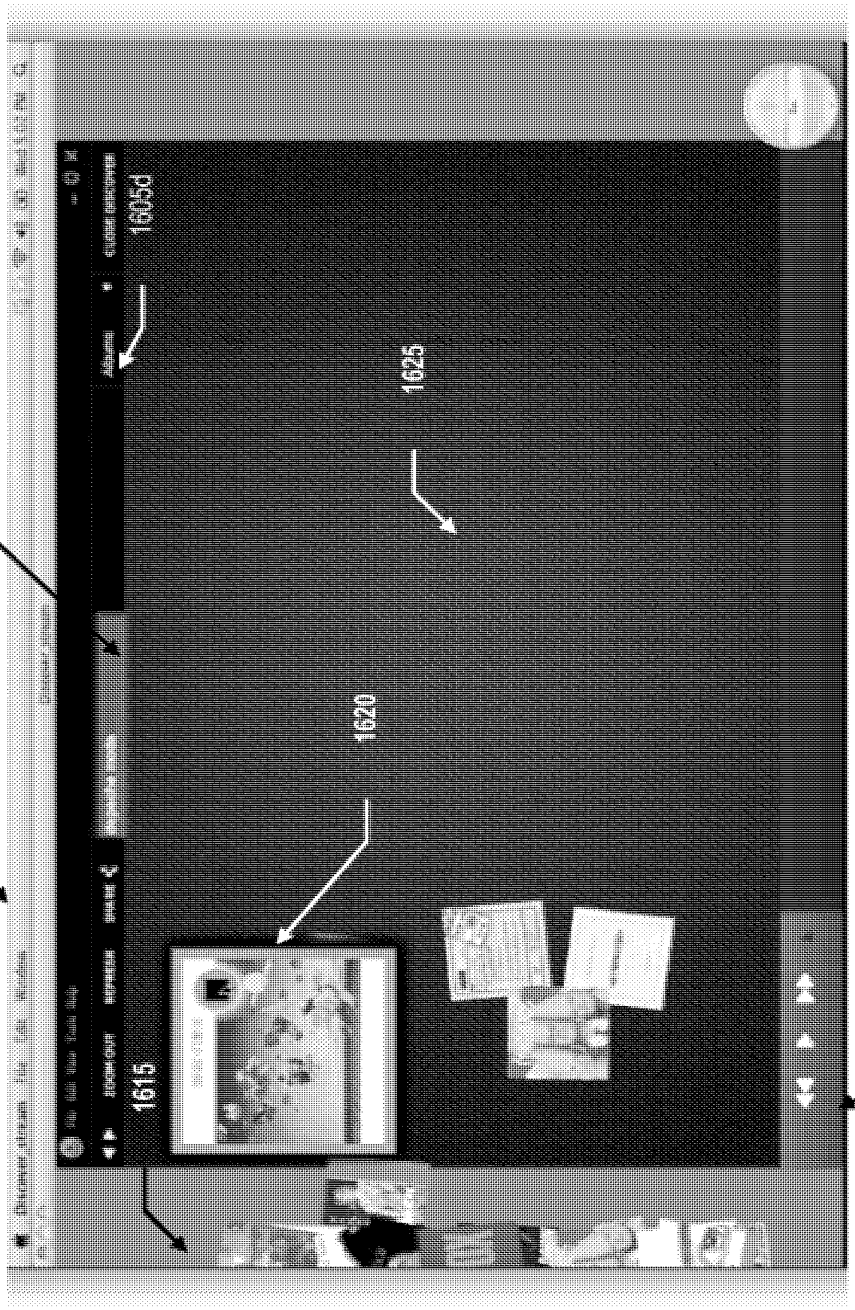



FIGURE 16a

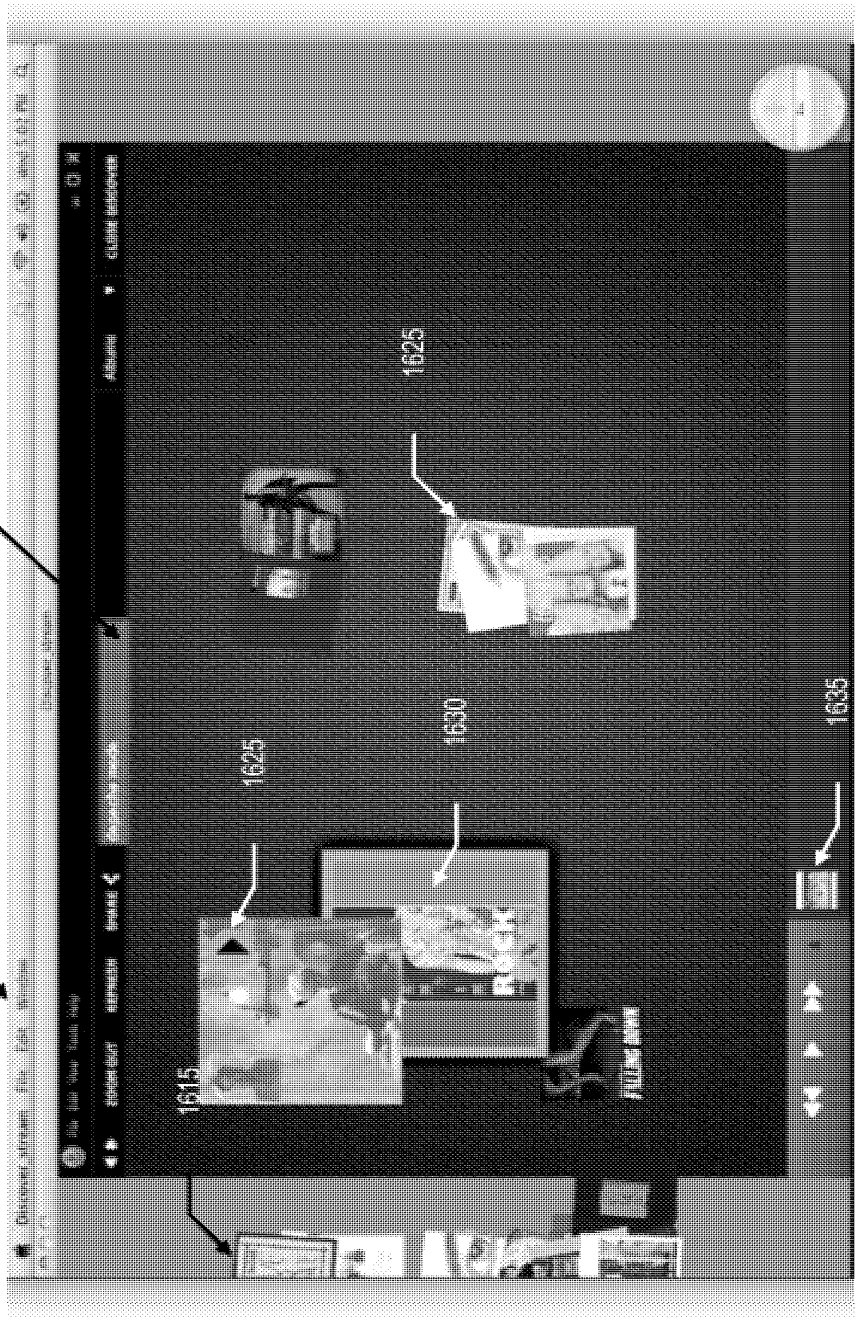



FIGURE 16b




FIGURE 16c

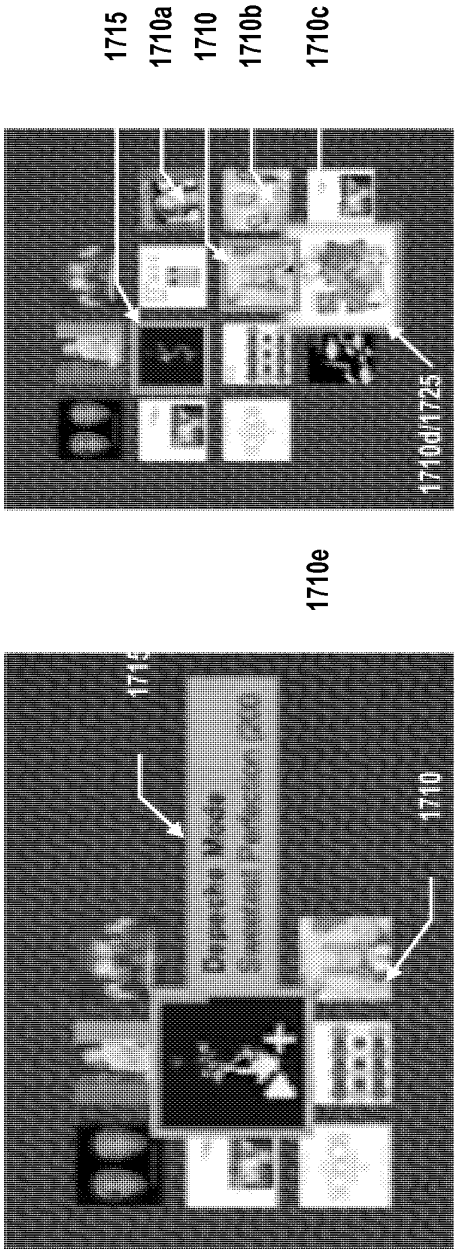



FIGURE 17a

FIGURE 17b

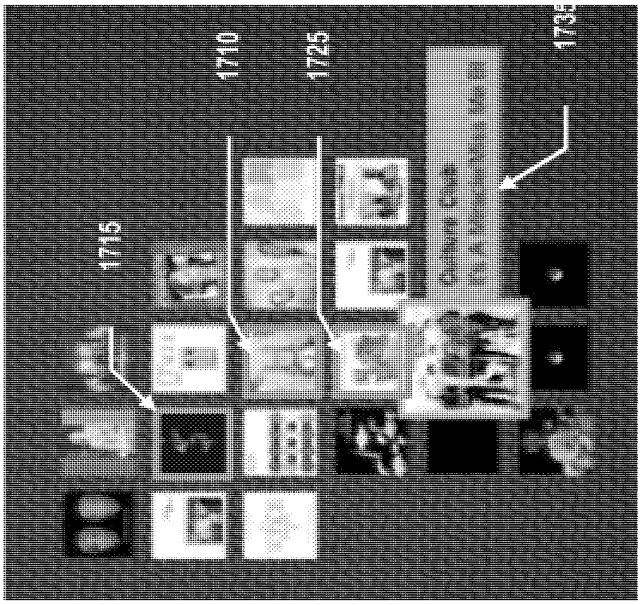



FIGURE 17c

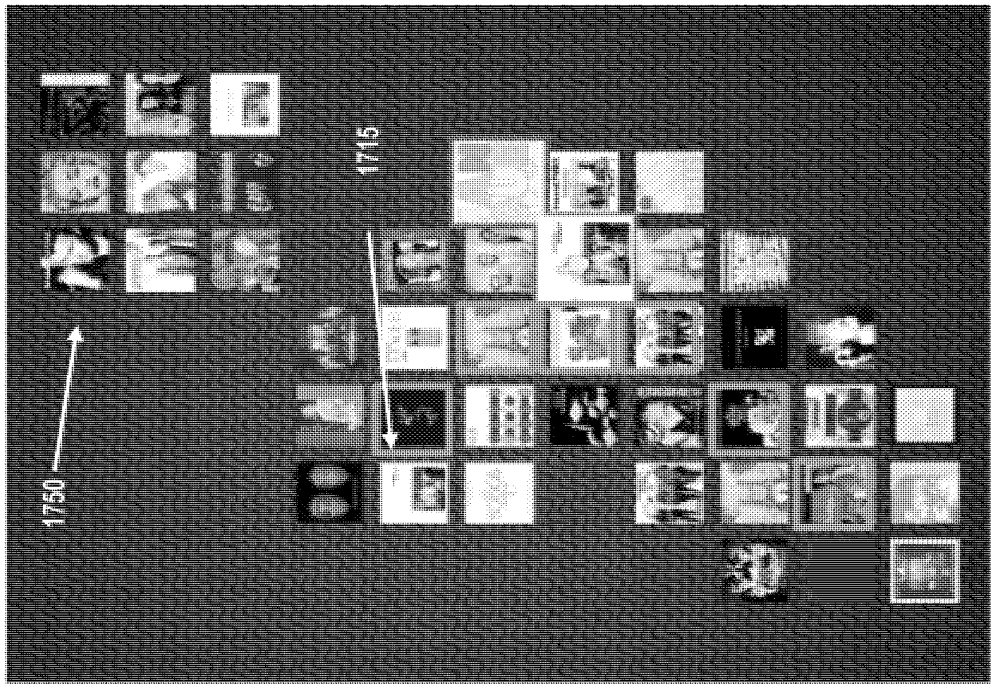



FIGURE 17e

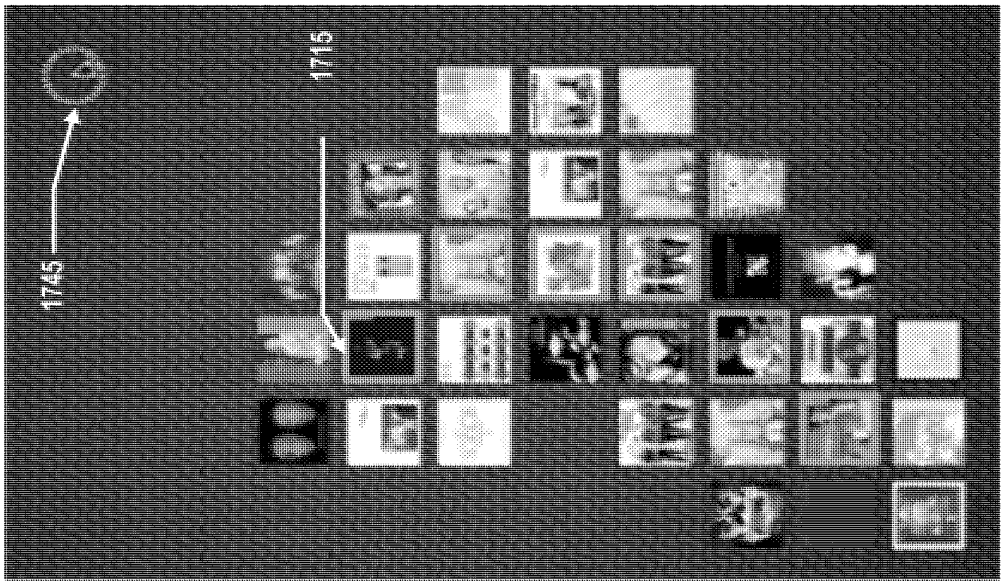



FIGURE 17d

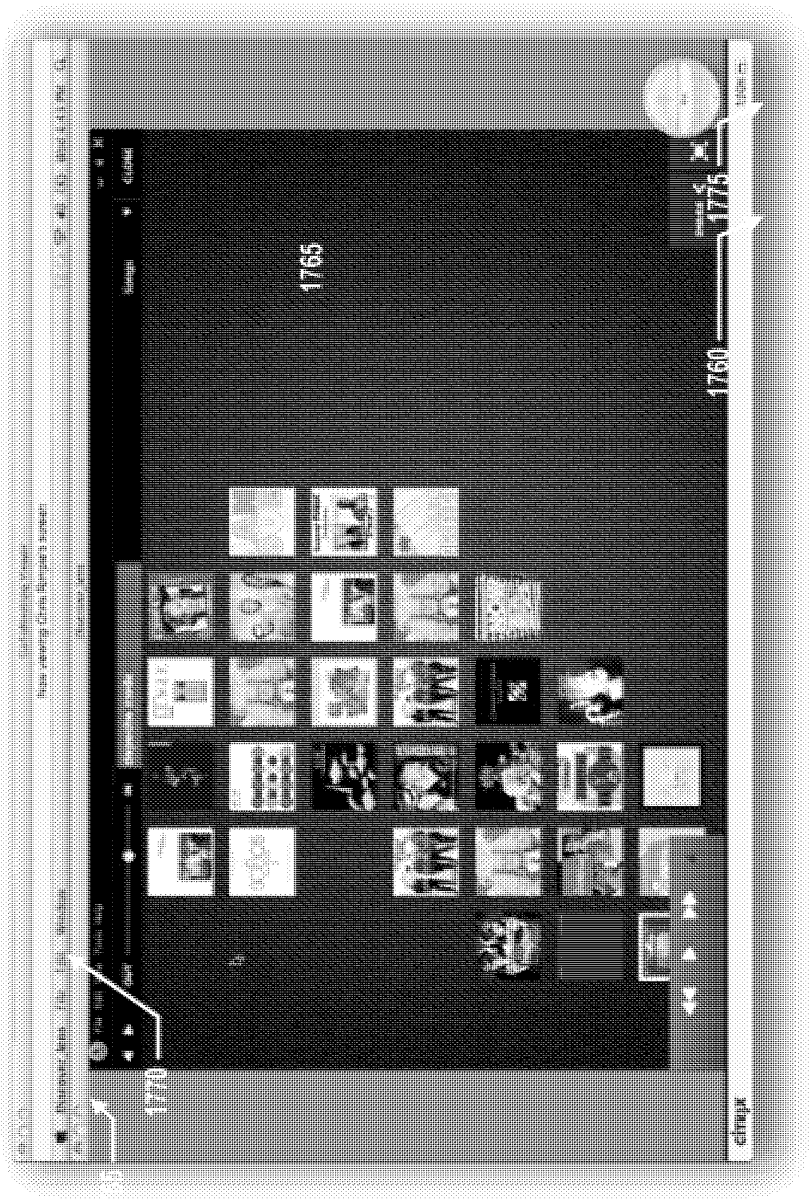



FIGURE 17f

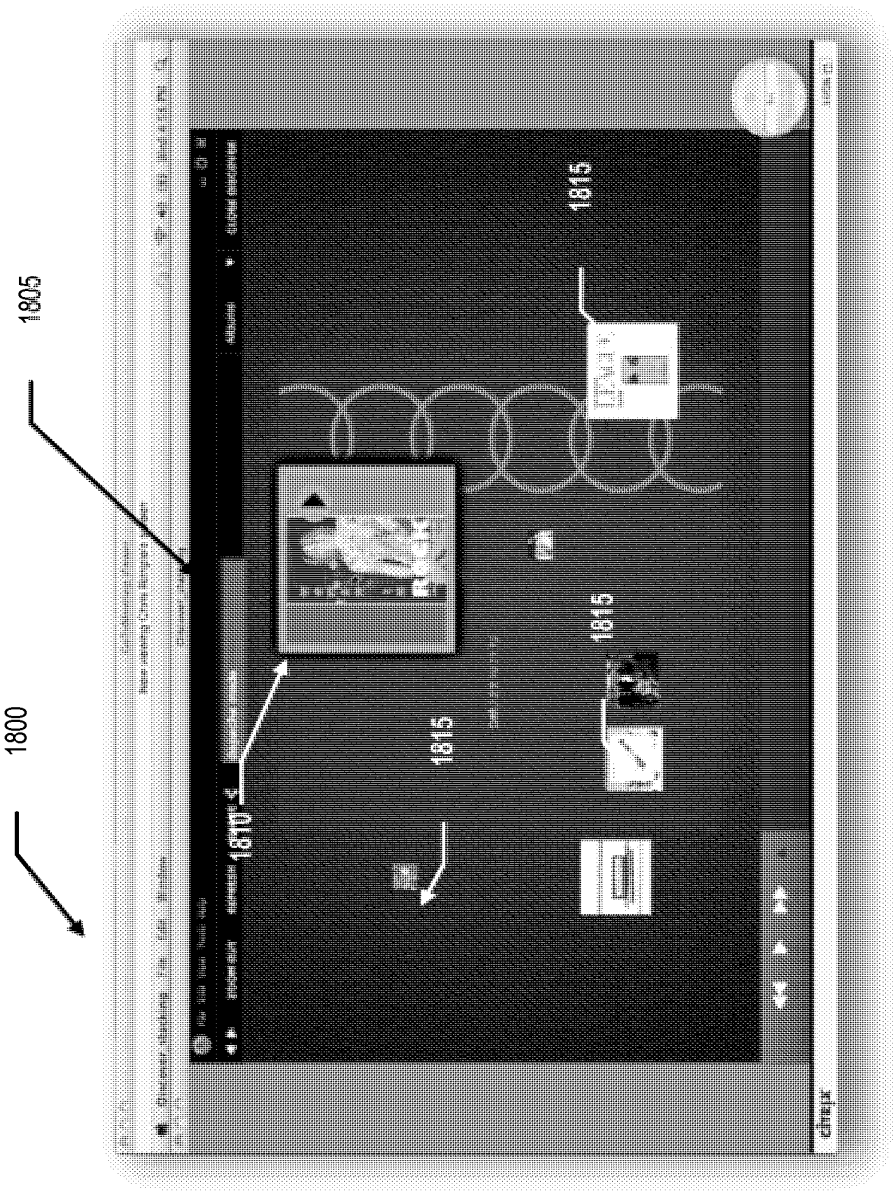



FIGURE 18a

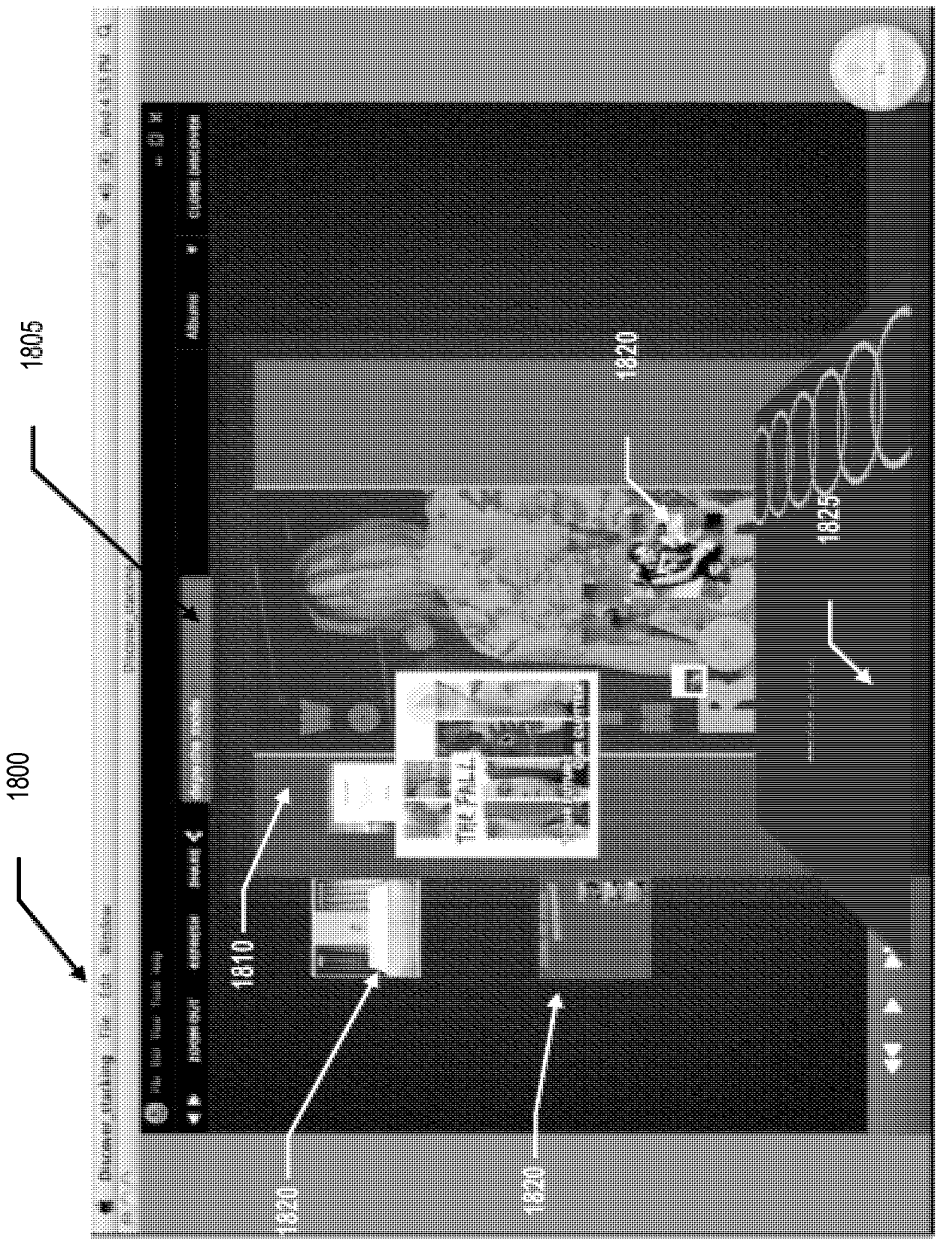



FIGURE 18b




FIGURE 18c

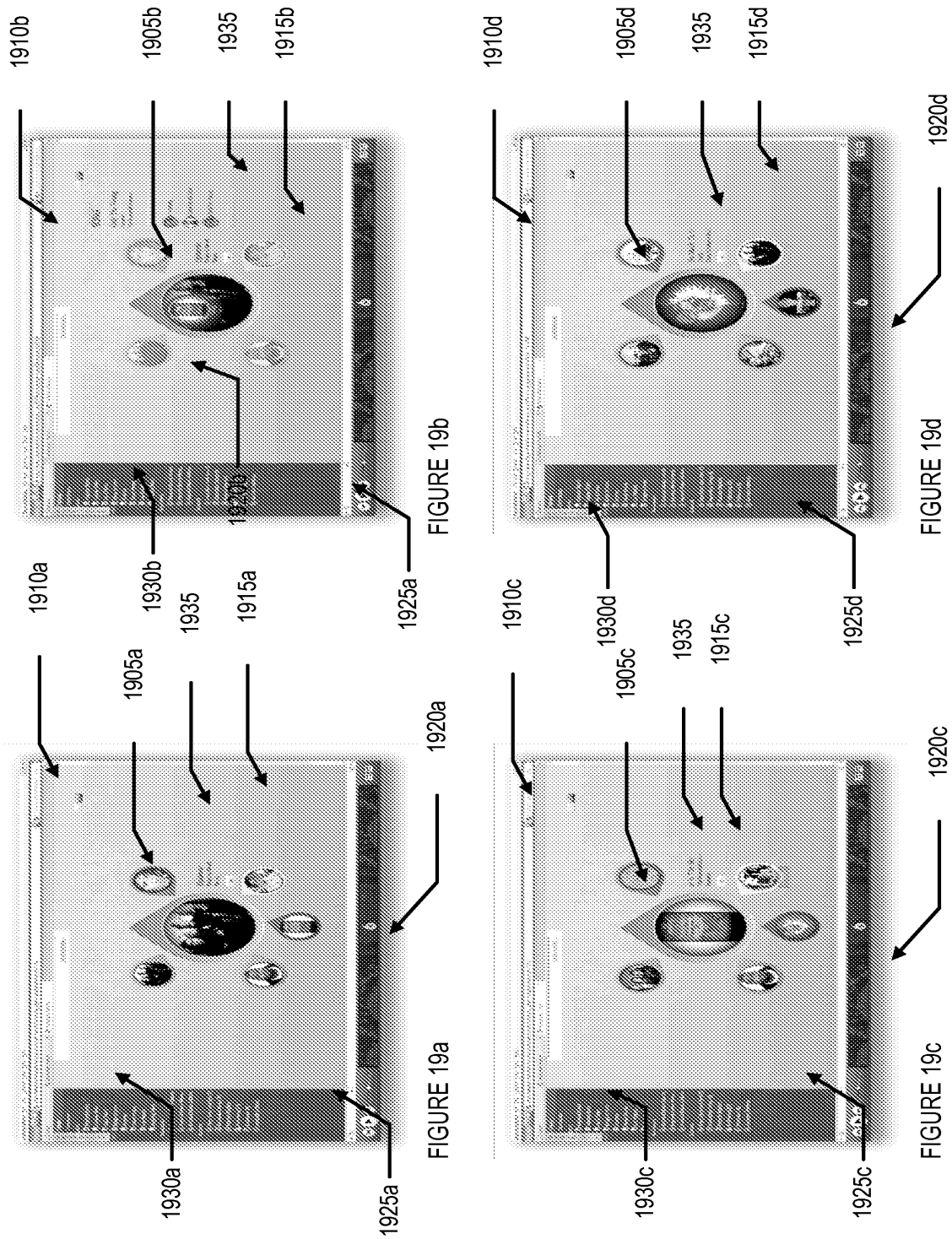



FIGURE 19a FIGURE 19b FIGURE 19c FIGURE 19d

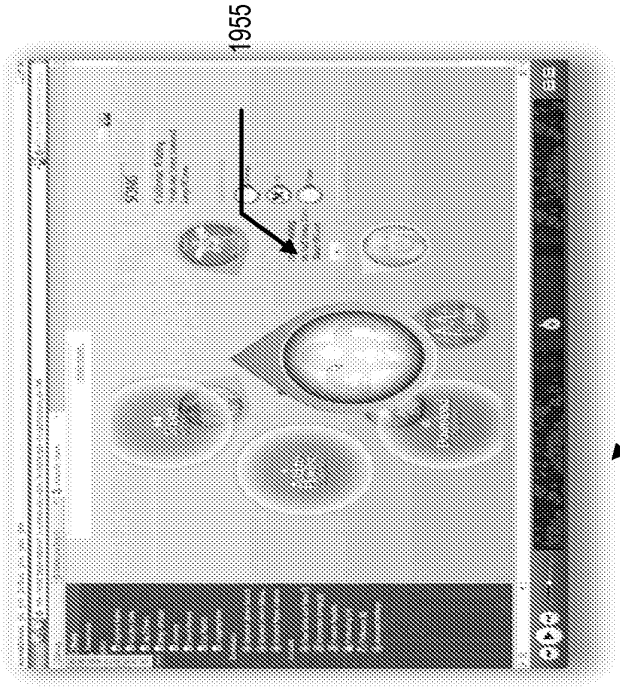



FIGURE 19f

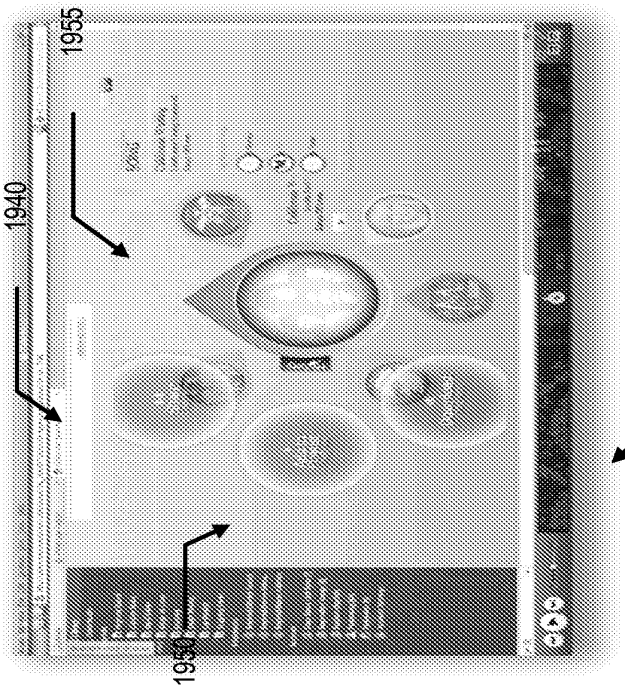



FIGURE 19e

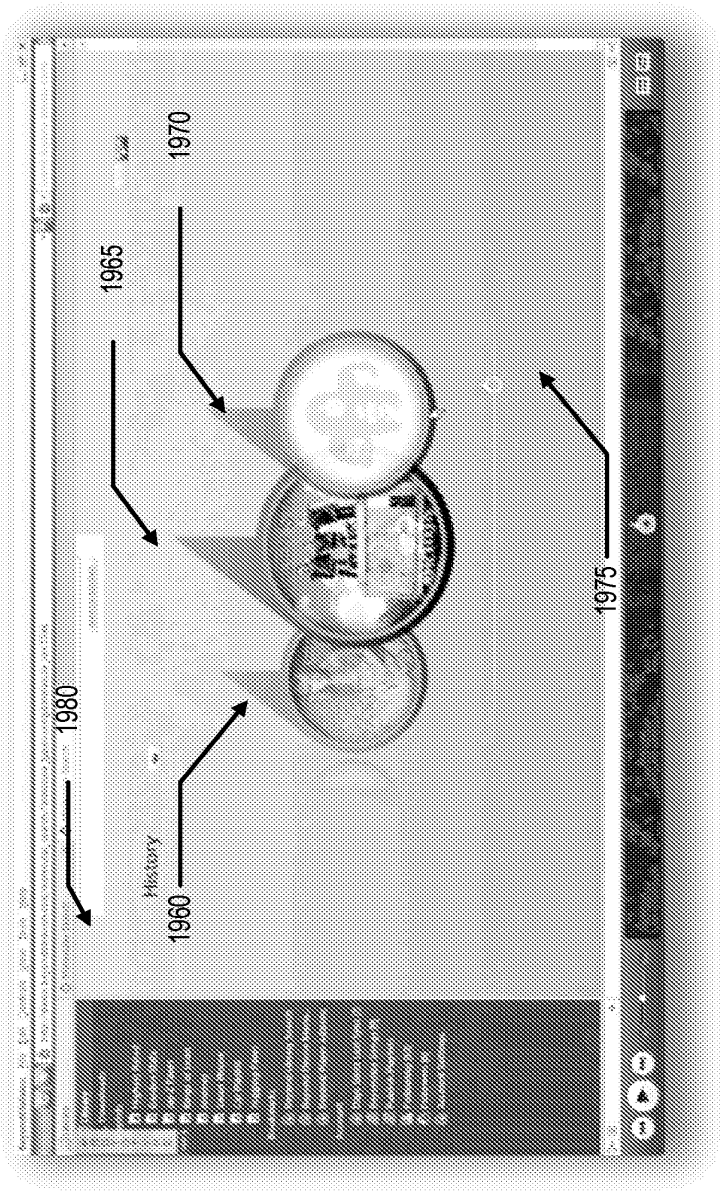



FIGURE 19g

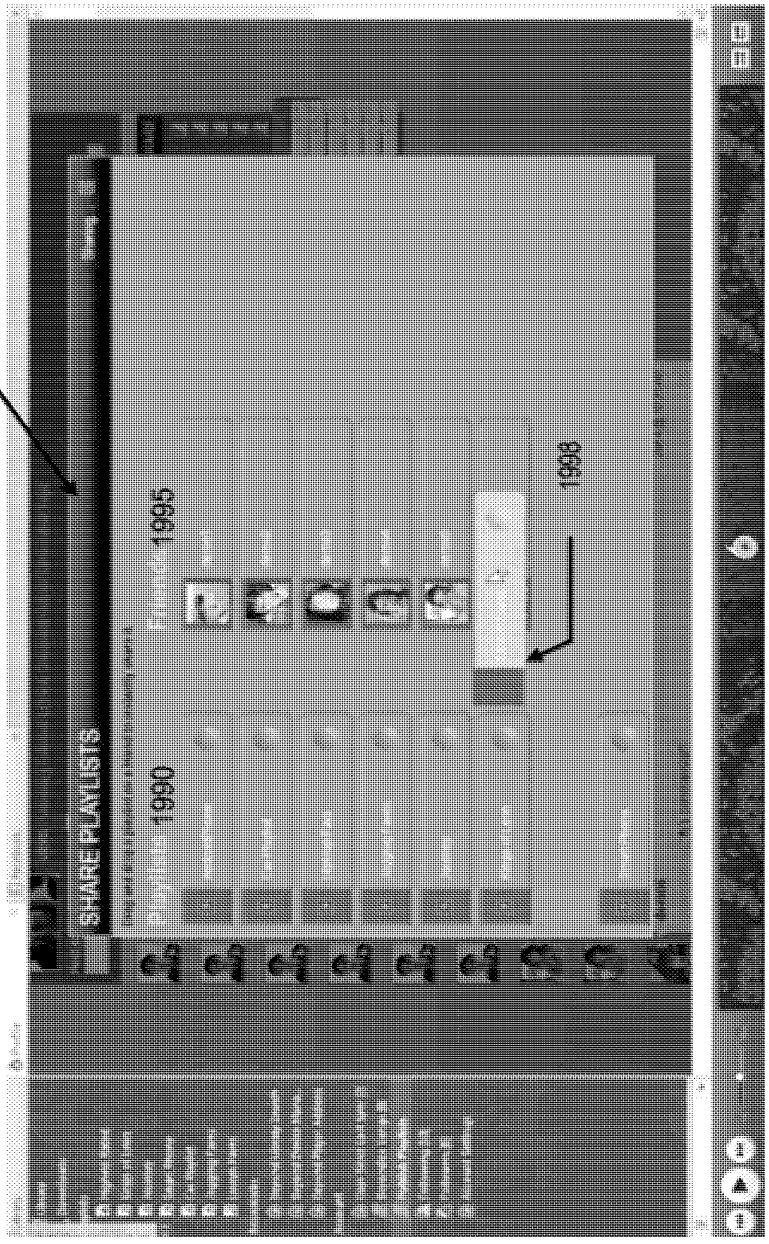



FIGURE 19h

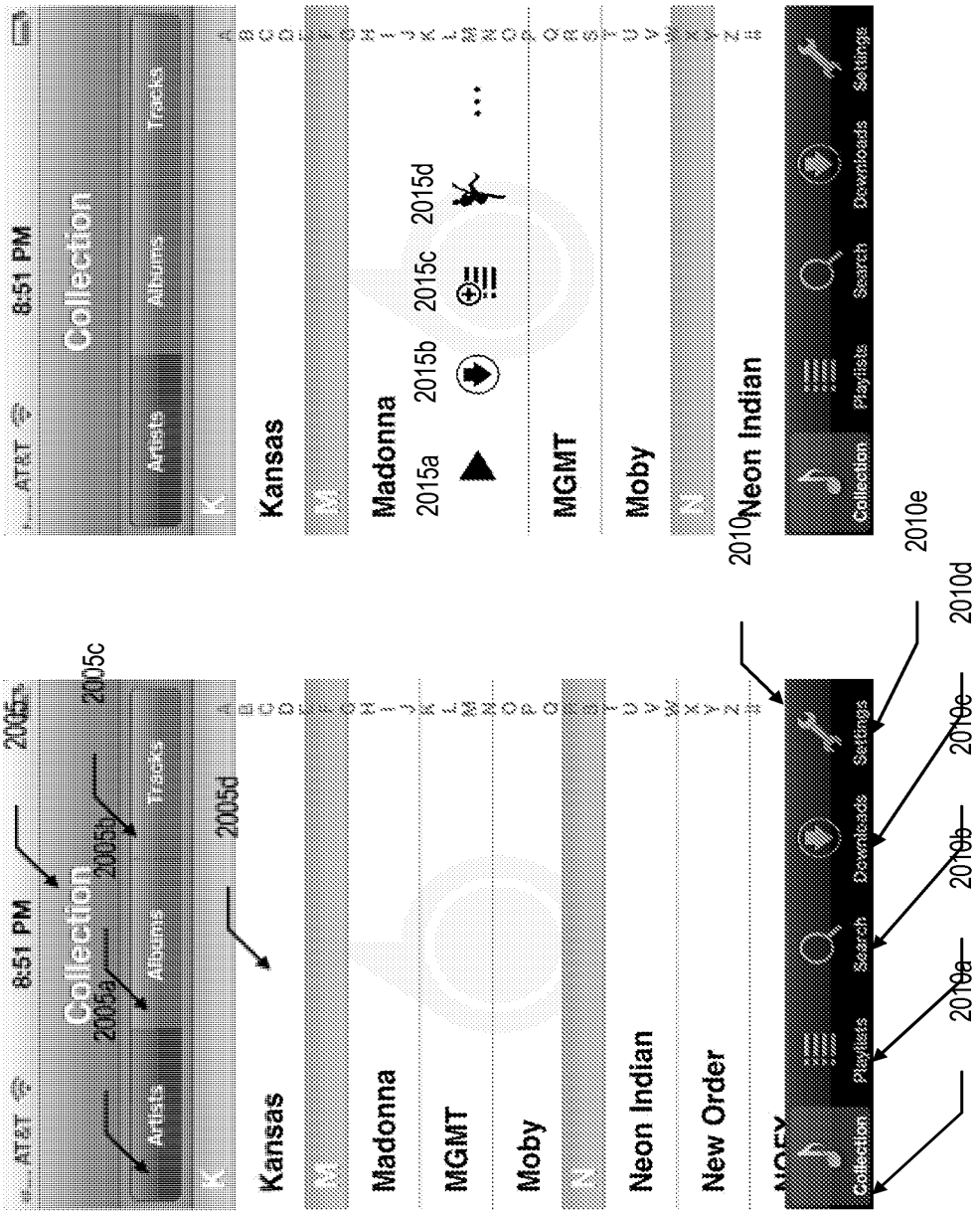



FIGURE 20a

FIGURE 20b

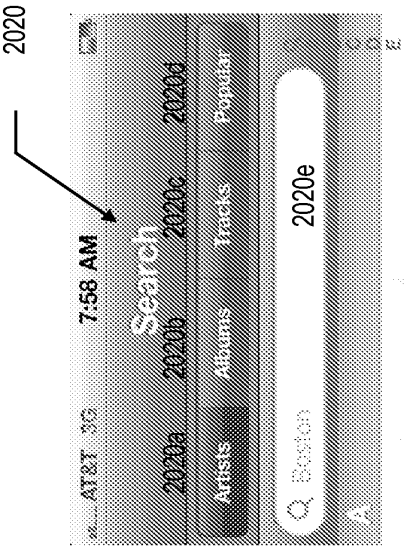



FIGURE 20c

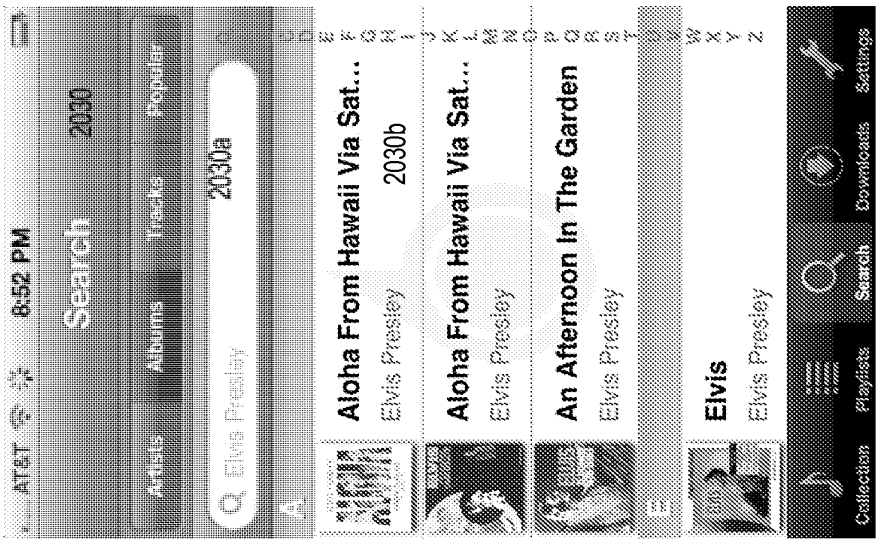



FIGURE 20d

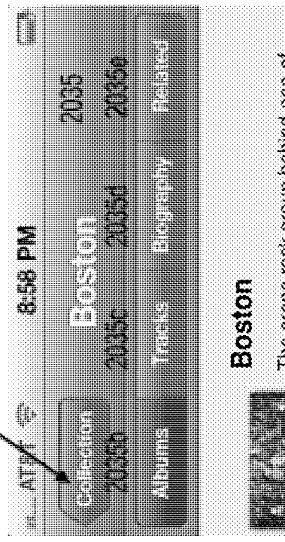



FIGURE 20e

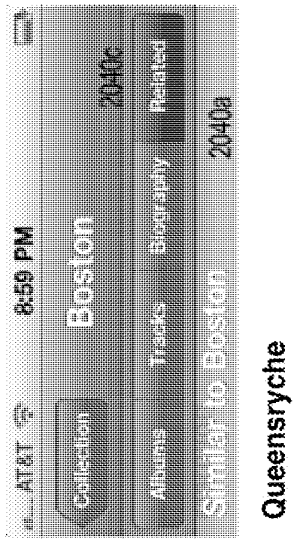



FIGURE 20f

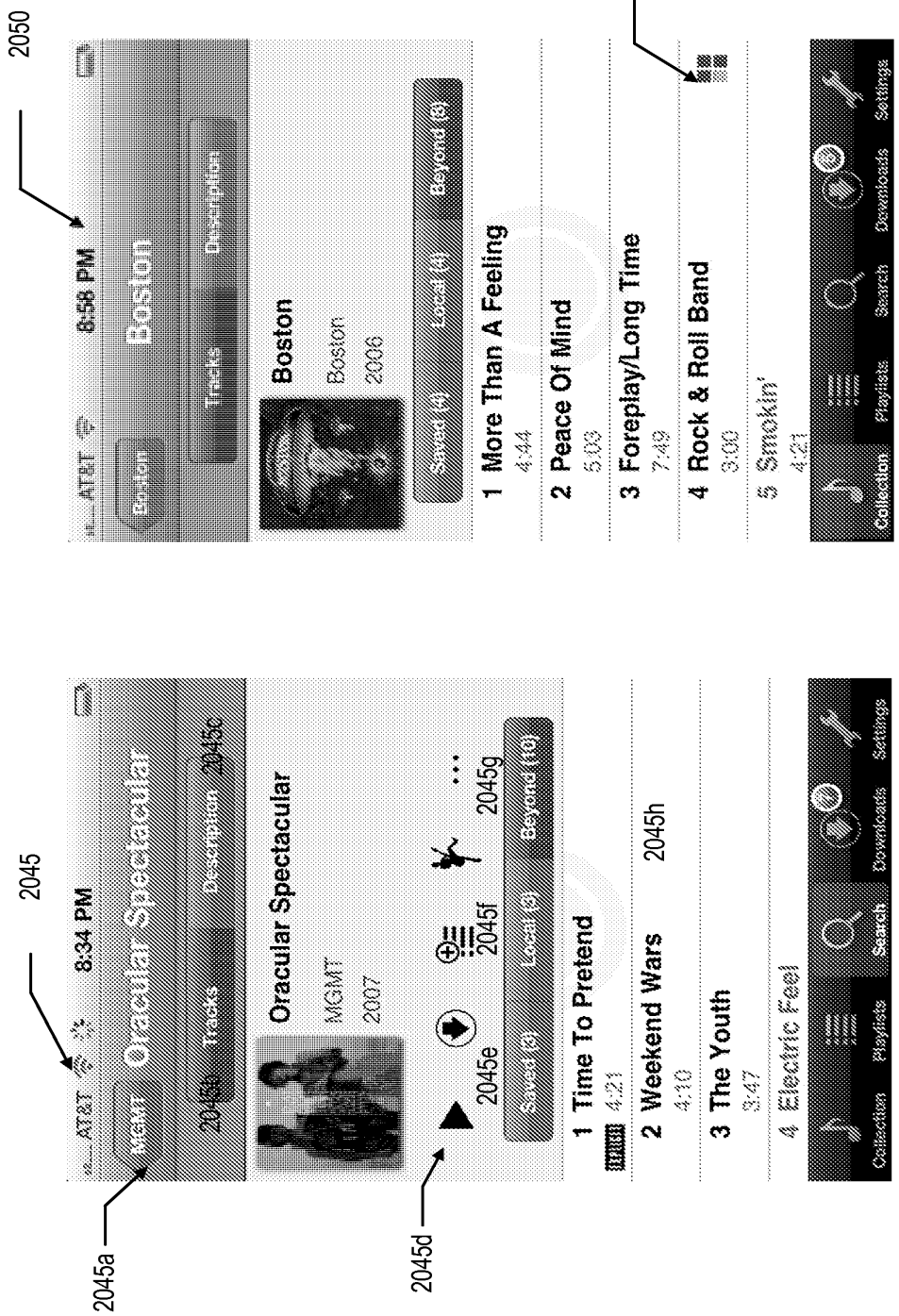



FIGURE 20g




FIGURE 20h

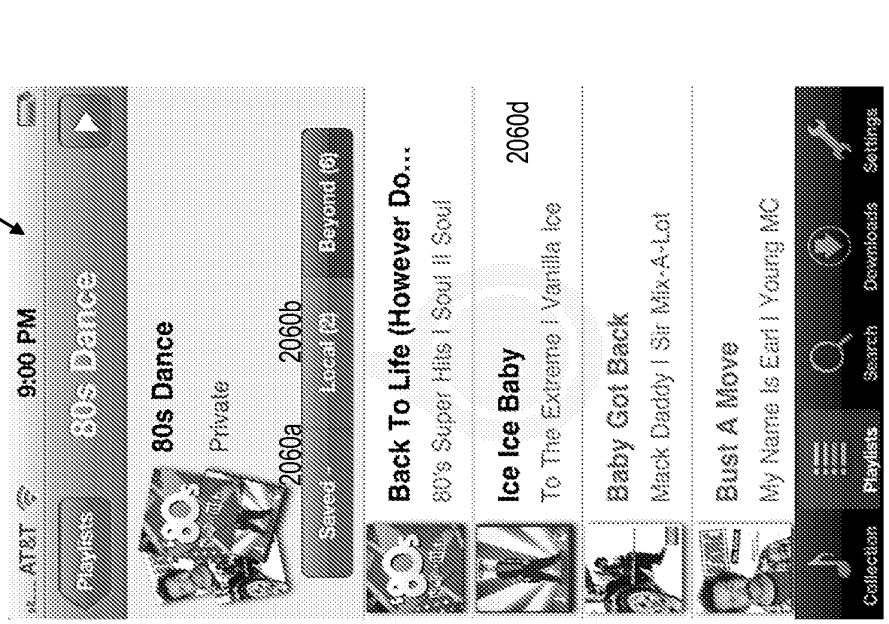



FIGURE 20j

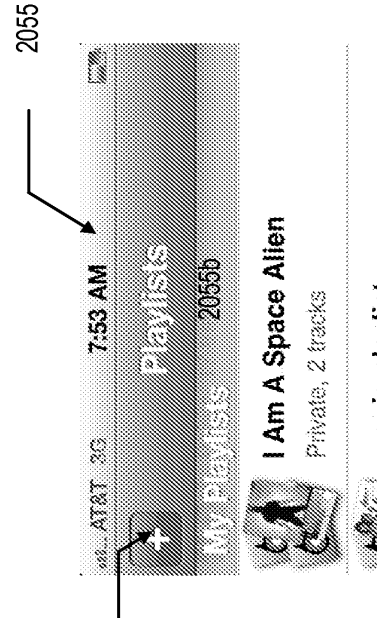



FIGURE 20i

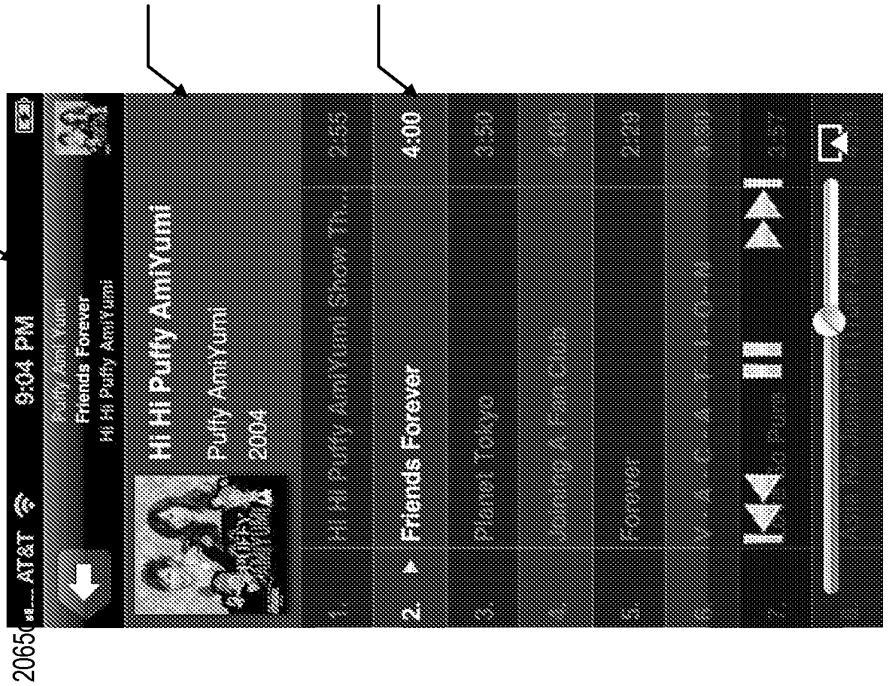
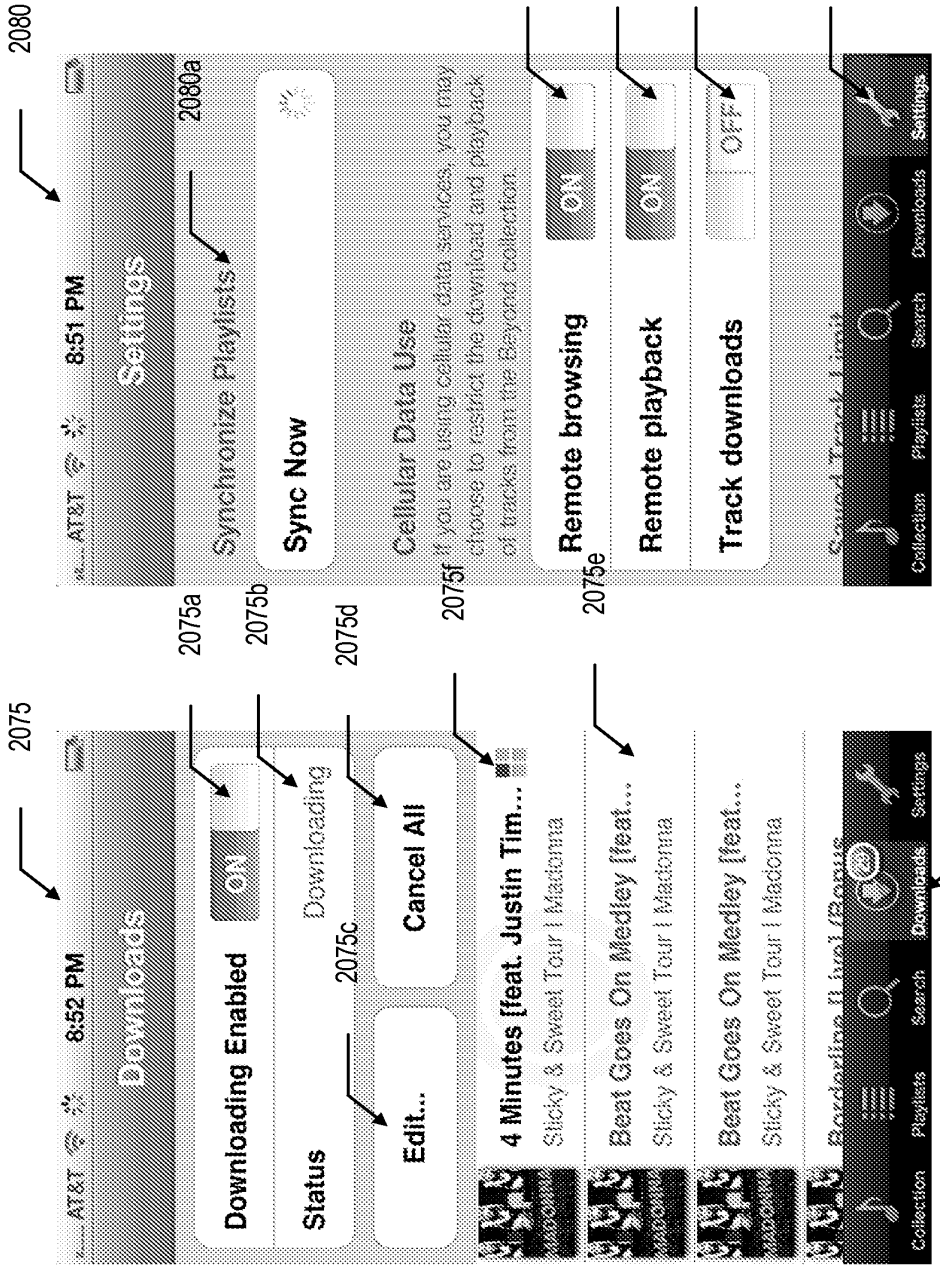



FIGURE 20l




FIGURE 20k


2075
AT&T
8:52 PM
Downloads
Downloading Enabled
ON
Status
Downloading
Edit...
Cancel All
4 Minutes [feat. Justin Tim...
Sticky & Sweet Tour | Madonna
Beat Goes On Medley [feat...
Sticky & Sweet Tour | Madonna
Beat Goes On Medley [feat...
Sticky & Sweet Tour | Madonna
Collection
Playlists
Search
Downloads
Settings
2075a
2075b
2075c
2075d
2075g
FIGURE 20m
2080
AT&T
8:51 PM
Settings
Synchronize Playlists
Sync Now
Cellular Data Use
If you are using cellular data services, you may choose to restrict the download and playback of tracks from the Beyond collection.
Remote browsing
ON
Remote playback
ON
Track downloads
OFF
Collection
Playlists
Search
Downloads
Settings
2080a
2075f
2075e
2080b
2080c
2080d
2080e
FIGURE 20n

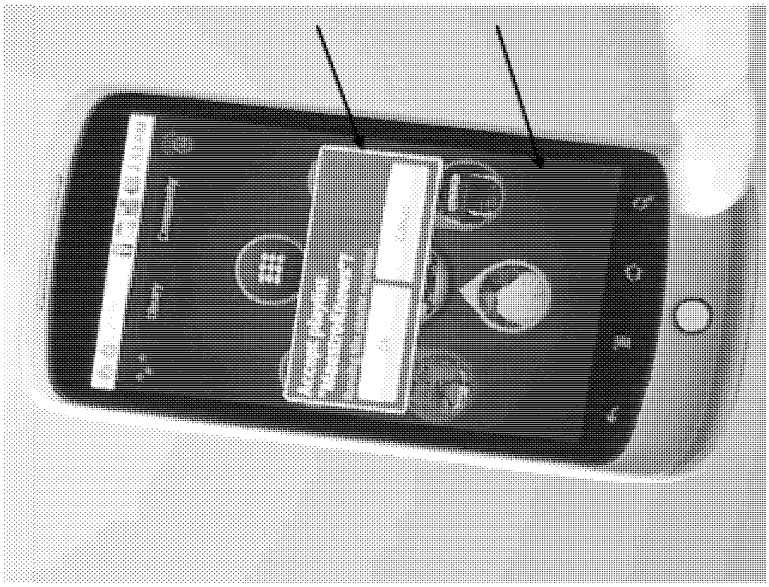



FIGURE 21b

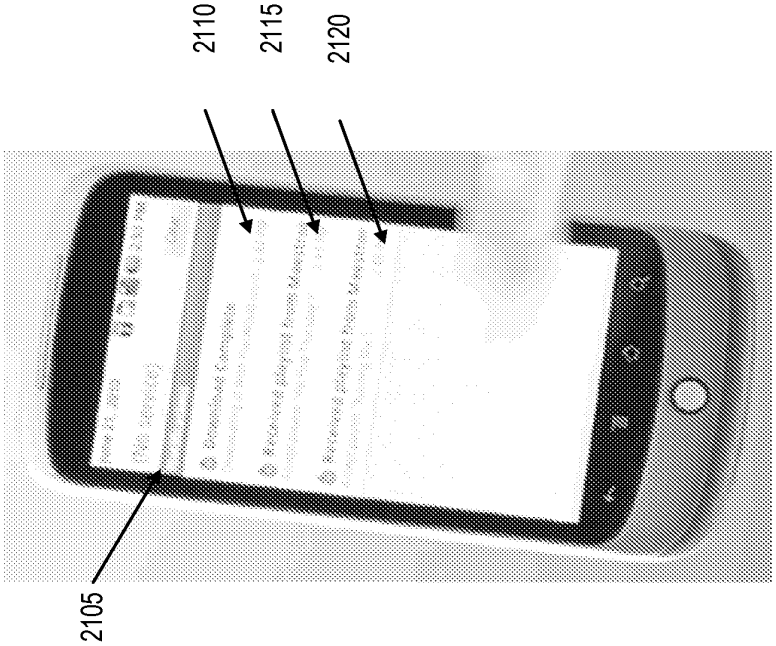



FIGURE 21a

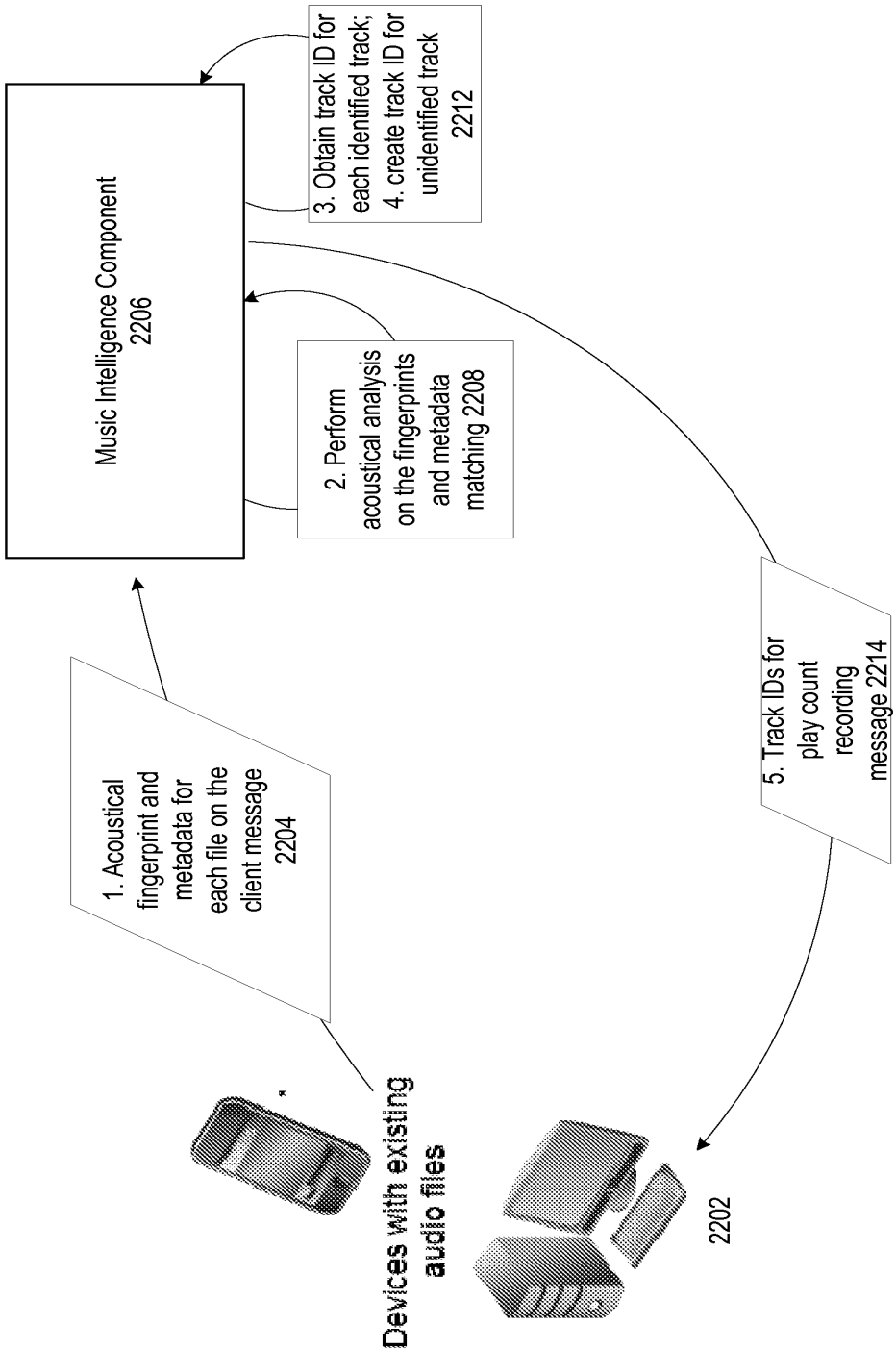

Music Intelligence Component
2206
3. Obtain track ID for each identified track; 4. create track ID for unidentified track
2212
2. Perform acoustical analysis on the fingerprints and metadata matching 2208
1. Acoustical fingerprint and metadata for each file on the client message
2204
5. Track IDs for play count recording message 2214
Devices with existing audio files
2202

FIGURE 22a

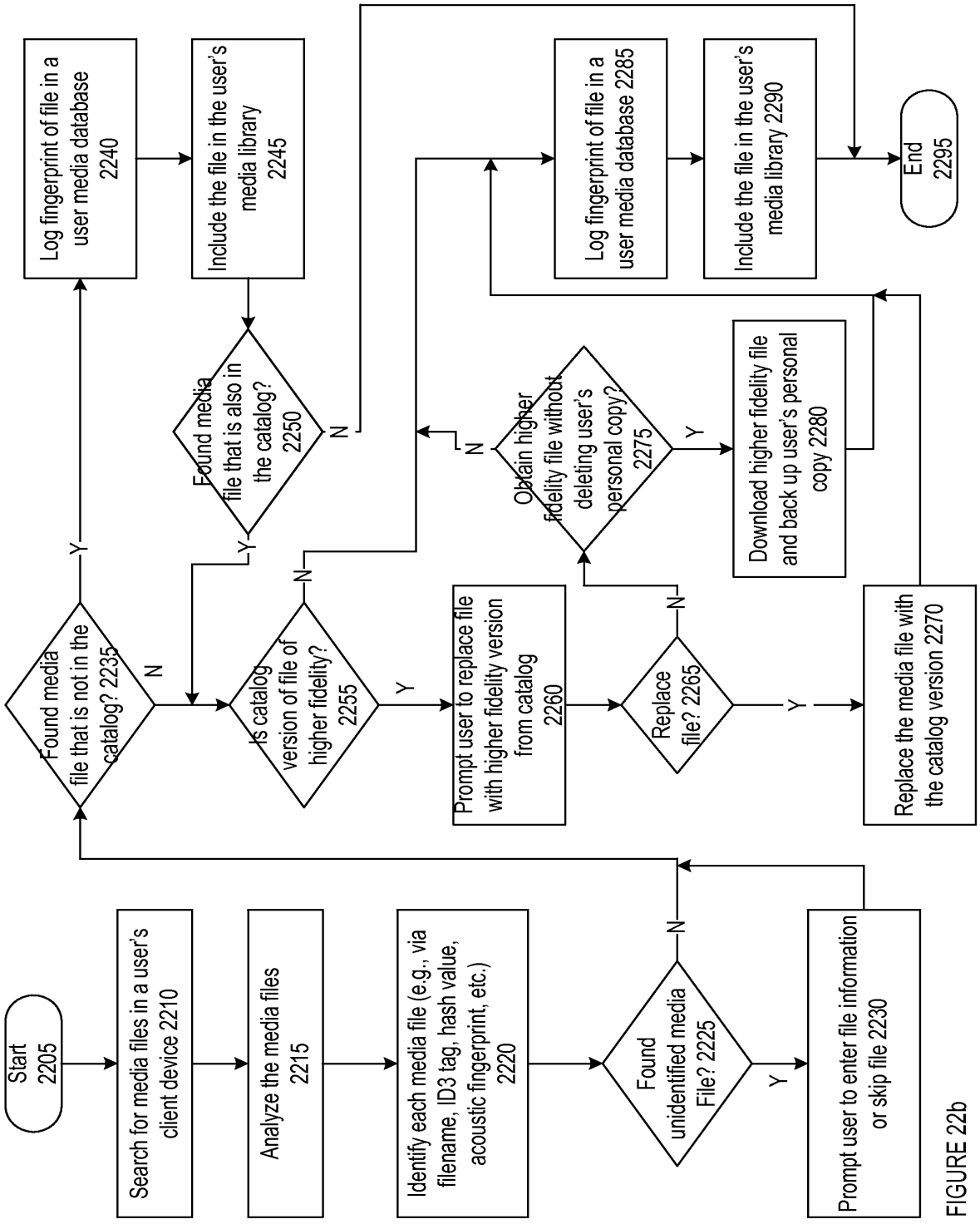

Start 2205
Search for media files in a user's client device 2210
Analyze the media files 2215
Identify each media file (e.g., via filename, ID3 tag, hash value, acoustic fingerprint, etc.) 2220
Found unidentified media File? 2225
Y
N
Prompt user to enter file information or skip file 2230
Found media file that is not in the catalog? 2235
Y
N
Log fingerprint of file in a user media database 2240
Include the file in the user's media library 2245
Found media file that is also in the catalog? 2250
Y
N
Is catalog version of file of higher fidelity? 2255
Y
N
Prompt user to replace file with higher fidelity version from catalog 2260
Replace file? 2265
Y
N
Replace the media file with the catalog version 2270
Obtain higher fidelity file without deleting user's personal copy? 2275
Y
N
Download higher fidelity file and back up user's personal copy 2280
Log fingerprint of file in a user media database 2285
Include the file in the user's media library 2290
End 2295

FIGURE 22b

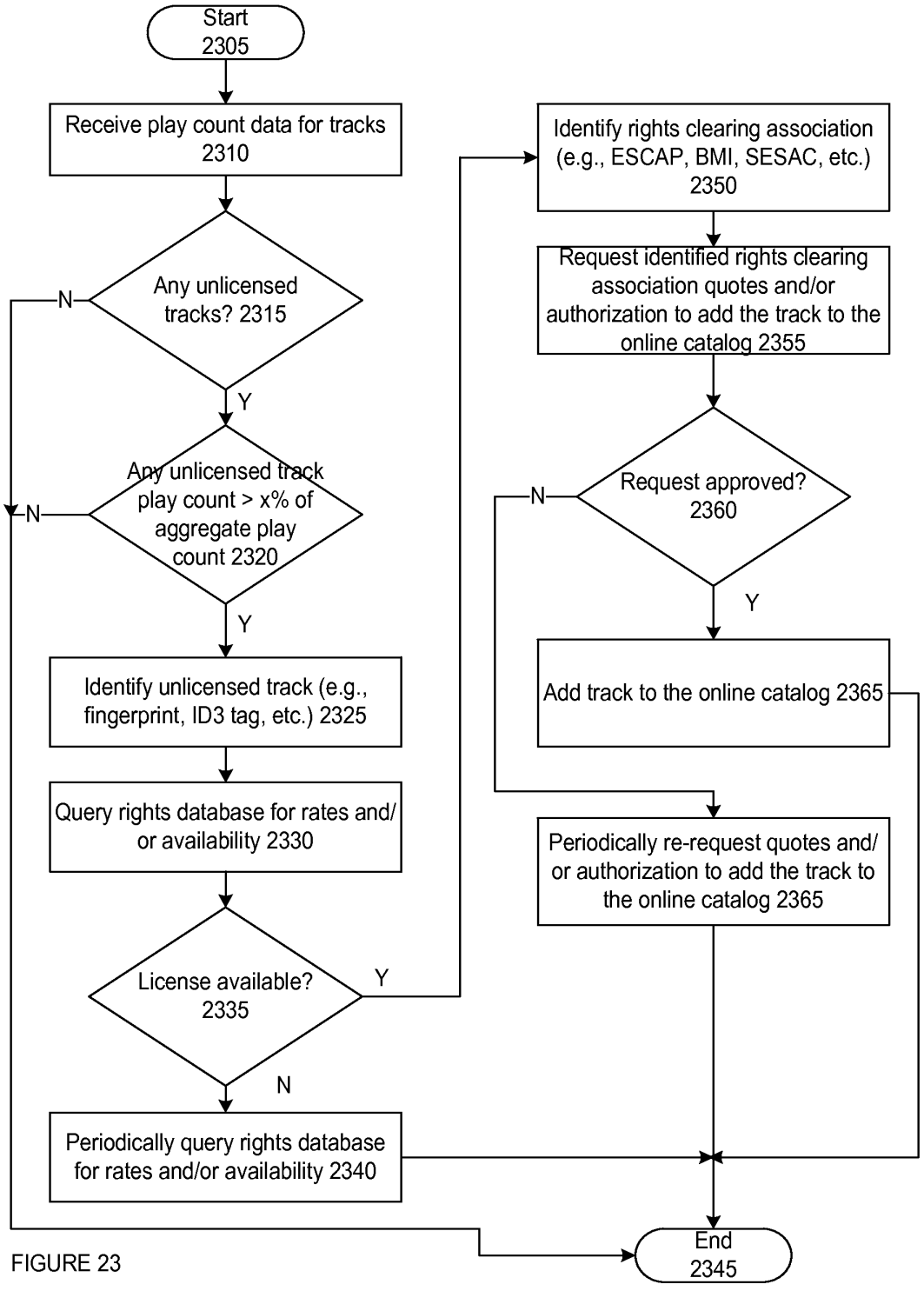

Start 2305
Receive play count data for tracks 2310
Any unlicensed tracks? 2315
N
Y
Any unlicensed track play count > x% of aggregate play count 2320
N
Y
Identify unlicensed track (e.g., fingerprint, ID3 tag, etc.) 2325
Query rights database for rates and/or availability 2330
License available? 2335
Y
N
Periodically query rights database for rates and/or availability 2340
Identify rights clearing association (e.g., ESCAP, BMI, SESAC, etc.) 2350
Request identified rights clearing association quotes and/or authorization to add the track to the online catalog 2355
Request approved? 2360
N
Y
Add track to the online catalog 2365
Periodically re-request quotes and/or authorization to add the track to the online catalog 2365
End 2345

FIGURE 23

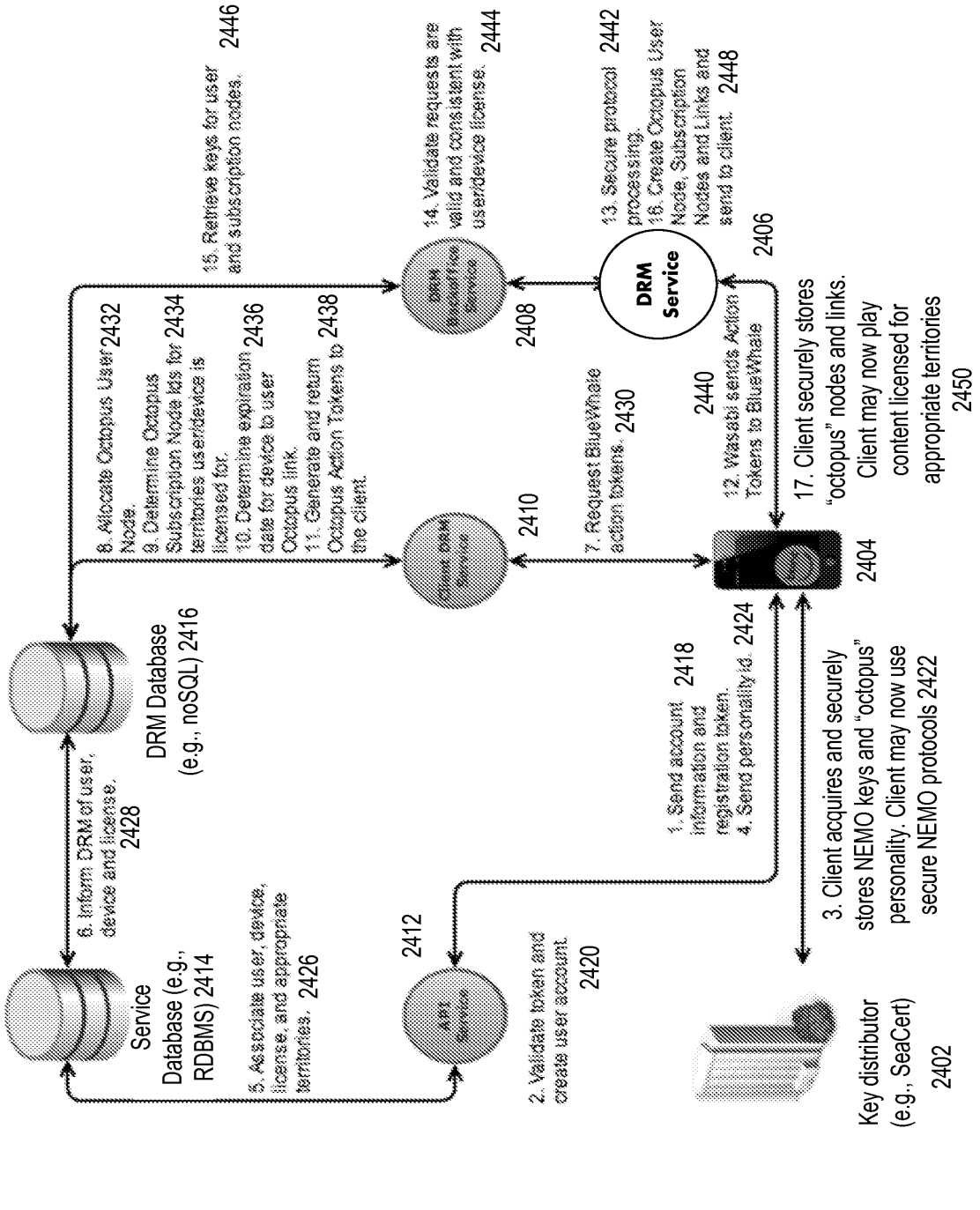

Key distributor (e.g., SeaCert) 2402
Service Database (e.g., RDBMS) 2414
DRM Database (e.g., noSQL) 2416
Client DRM Service 2410
Client Blue Whale Service 2408
DRM Service 2406
Client Wasabi Service 2404
Wasabi Service 2412
Blue Whale Service 2424
6. Inform DRM of user, device and license. 2428
8. Allocate Octopus User 2432
9. Determine Octopus Subscription Node ids for 2434 territories user/device is licensed for.
10. Determine expiration 2436 date for device to user Octopus link.
11. Generate and return 2438 Octopus Action Tokens to the client.
15. Retrieve keys for user and subscription nodes. 2446
14. Validate requests are valid and consistent with user/device license. 2444
13. Secure protocol 2442 processing.
16. Create Octopus User Node, Subscription Nodes and Links and send to client. 2448
5. Associate user, device, license, and appropriate territories. 2426
2. Validate token and create user account. 2420
7. Request BlueWhale action tokens. 2430
12. Wasabi sends Action Tokens to BlueWhale 2440
17. Client securely stores "octopus" nodes and links. Client may now play content licensed for appropriate territories 2450
1. Send account information and registration token. 2418
4. Send personality id. 2424
3. Client acquires and securely stores NEMO keys and "octopus" personality. Client may now use secure NEMO protocols 2422

FIGURE 24a

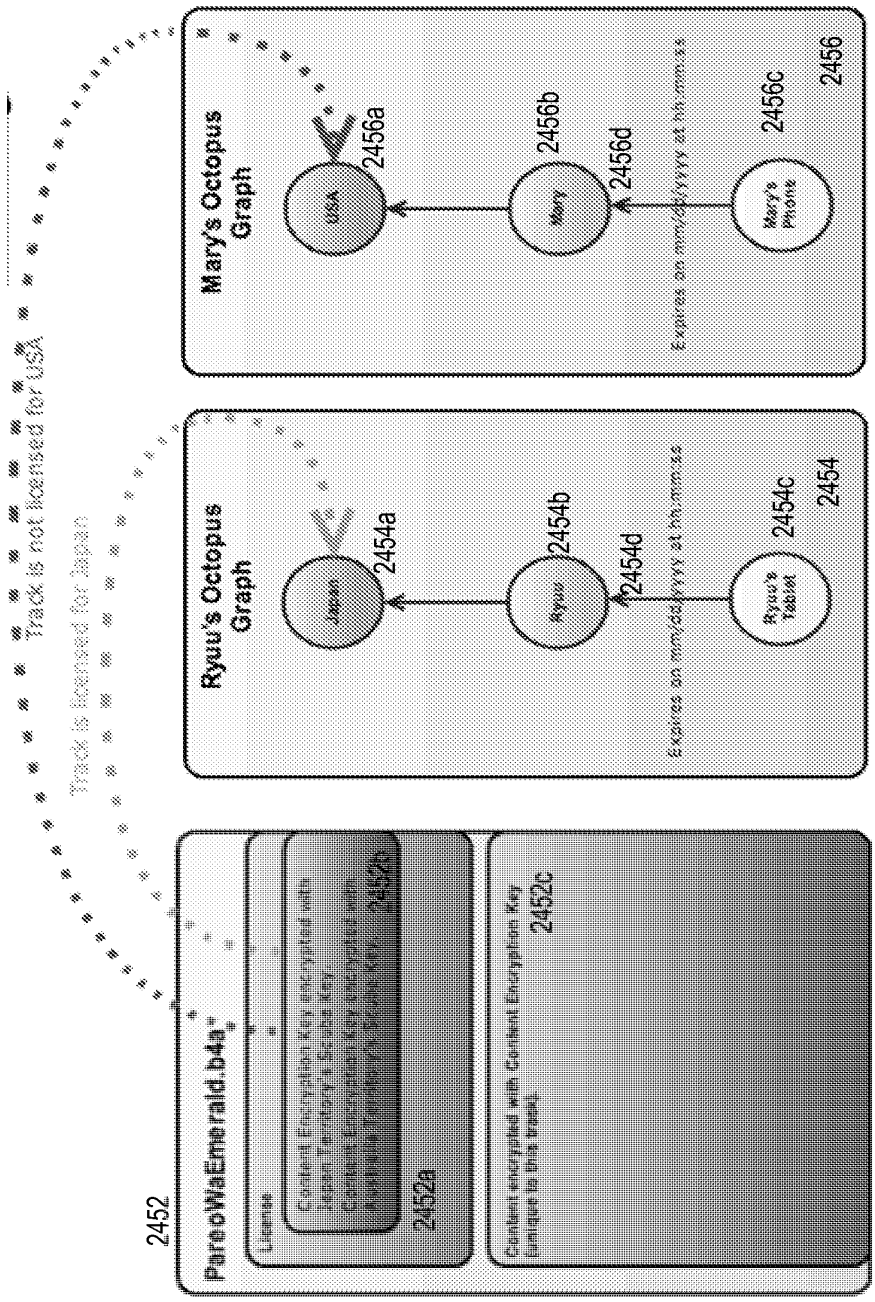

Track is not licensed for USA
Track is licensed for Japan
2452
PareoWaEmerald.b4a
License
Content Encryption Key encrypted with Japan Territorial Seeds Key
2452a
2452b
Content encrypted with Content Encryption Key (unique to this track)
2452c
Ryuu's Octopus Graph
Japan
2454a
Ryuu
2454b
2454d
Ryuu's Tablet
2454c
2454
As long as the device to user link has not expired, client on Ryuu's phone may retrieve the Japan Territory's key, decrypt the content encryption key, and decrypt the track
Mary's Octopus Graph
USA
2456a
Mary
2456b
2456d
Mary's Phone
2456c
2456
Client on Mary's phone may not access the keys necessary to decrypt the track

FIGURE 24b

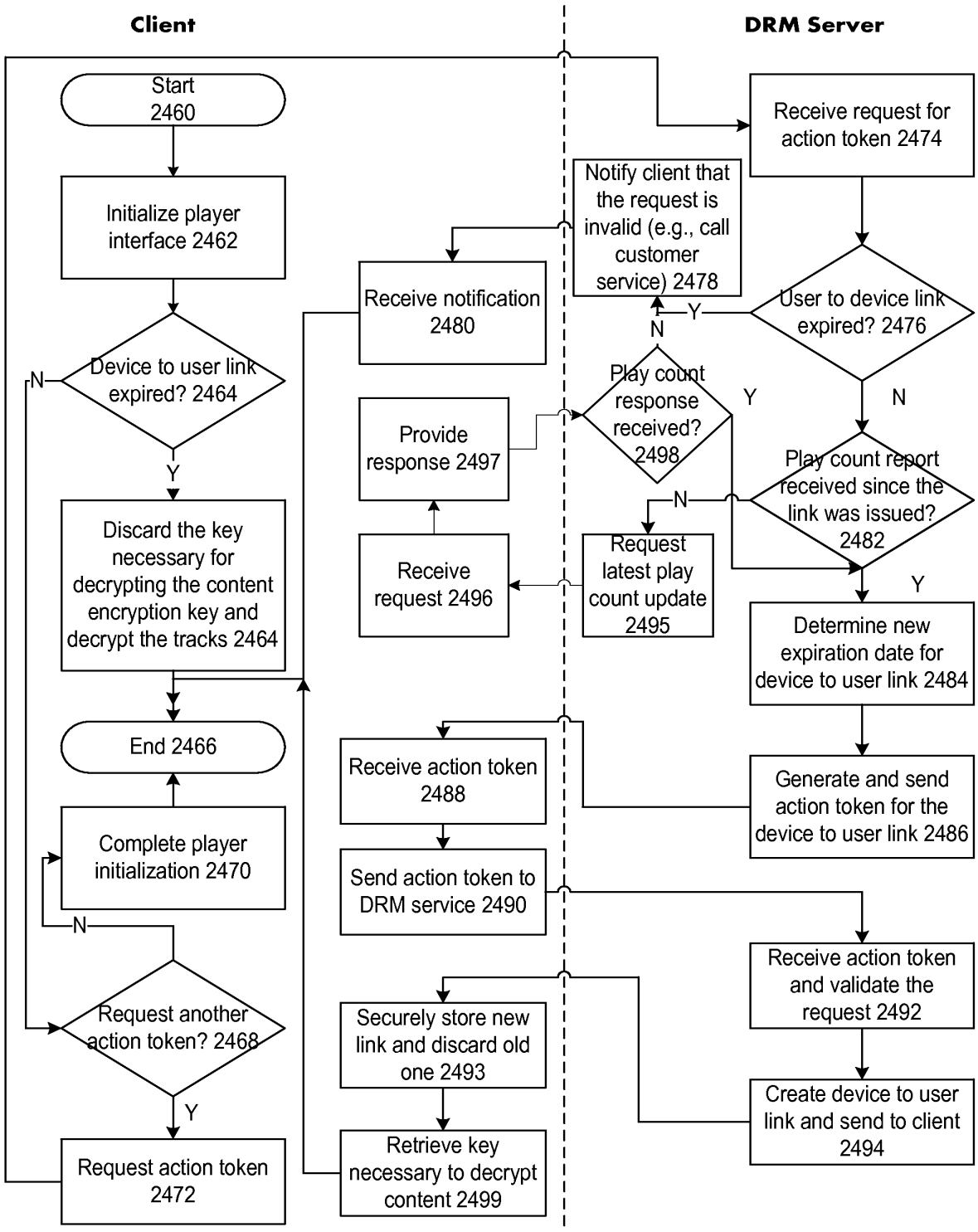

Client
DRM Server
Start 2460
Initialize player interface 2462
Device to user link expired? 2464
N
Y
Discard the key necessary for decrypting the content encryption key and decrypt the tracks 2464
End 2466
Complete player initialization 2470
N
Request another action token? 2468
Y
Request action token 2472
Receive notification 2480
Provide response 2497
Receive request 2496
Receive action token 2488
Send action token to DRM service 2490
Securely store new link and discard old one 2493
Retrieve key necessary to decrypt content 2499
Receive request for action token 2474
Notify client that the request is invalid (e.g., call customer service) 2478
User to device link expired? 2476
Y
N
Play count response received? 2498
Y
N
Request latest play count update 2495
Play count report received since the link was issued? 2482
N
Y
Determine new expiration date for device to user link 2484
Generate and send action token for the device to user link 2486
Receive action token and validate the request 2492
Create device to user link and send to client 2494

FIGURE 24c

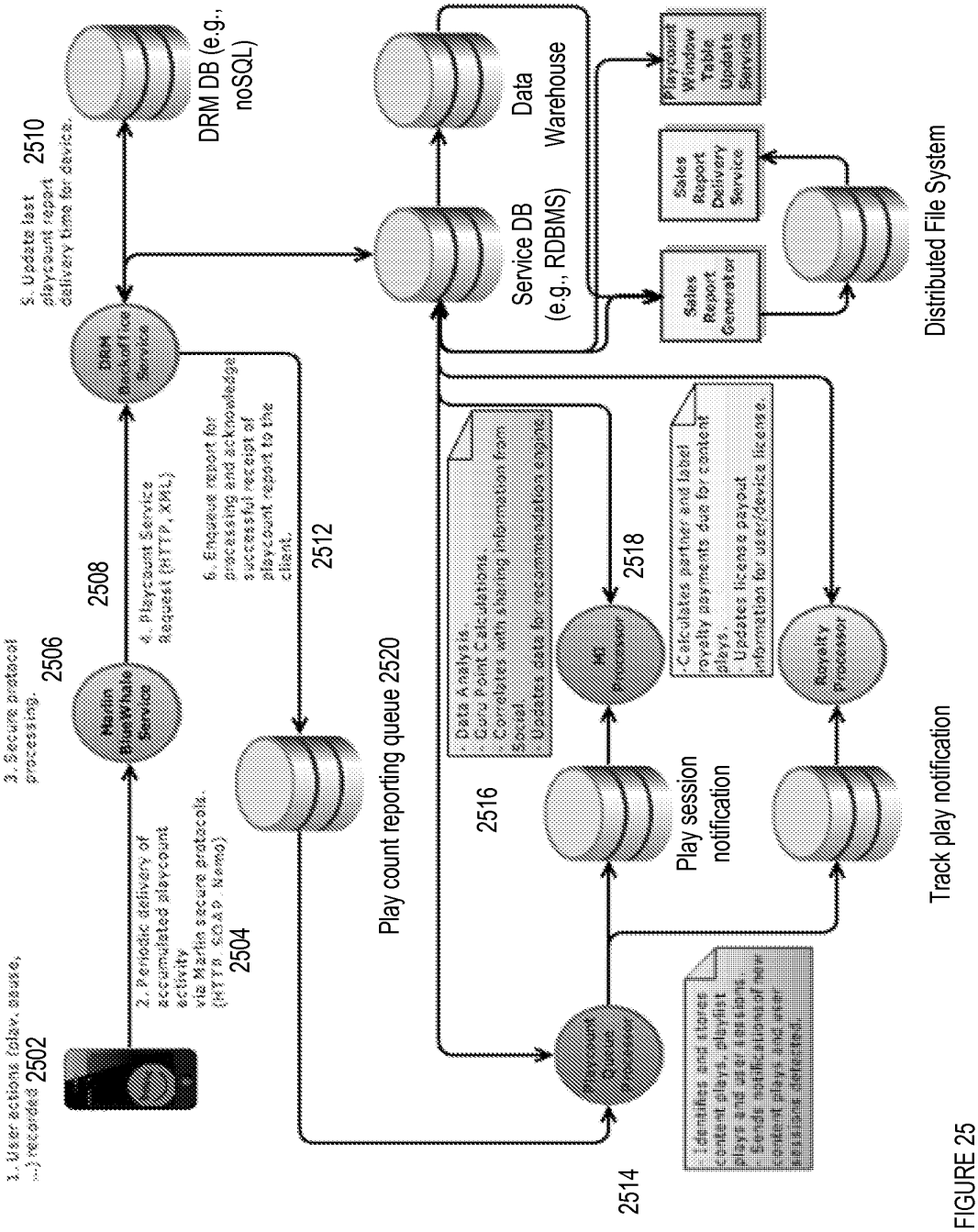

1. User actions (play, pause, ...) recorded 2502
2. Periodic delivery of accumulated playcount activity via Martini secure protocols. (HTTP, SOAP, Hessian)
2504
3. Secure protocol processing.
2506
4. Playcount Service Request (HTTP, XML)
2508
5. Update last playcount report delivery time for device.
2510
6. Enqueue report for processing and acknowledge successful receipt of playcount report to the client.
2512
Martini Backhaul Service
Data Acquisition Service
DRM DB (e.g., noSQL)
Service DB (e.g., RDBMS)
Data Warehouse
Playcount Window Table Update Service
Sales Report Delivery Service
Sales Report Generator
Distributed File System
Play count reporting queue 2520
Data Analysis
Core Point Calculations
Correlates with existing information from Social
Updates data for recommendation engine
2516
Set Processor
2518
Calculates partner and label royalty payments due for content plays.
Updates license payout information for user/device license.
Royalty Processor
Play session notification
Track play notification
2514

FIGURE 25

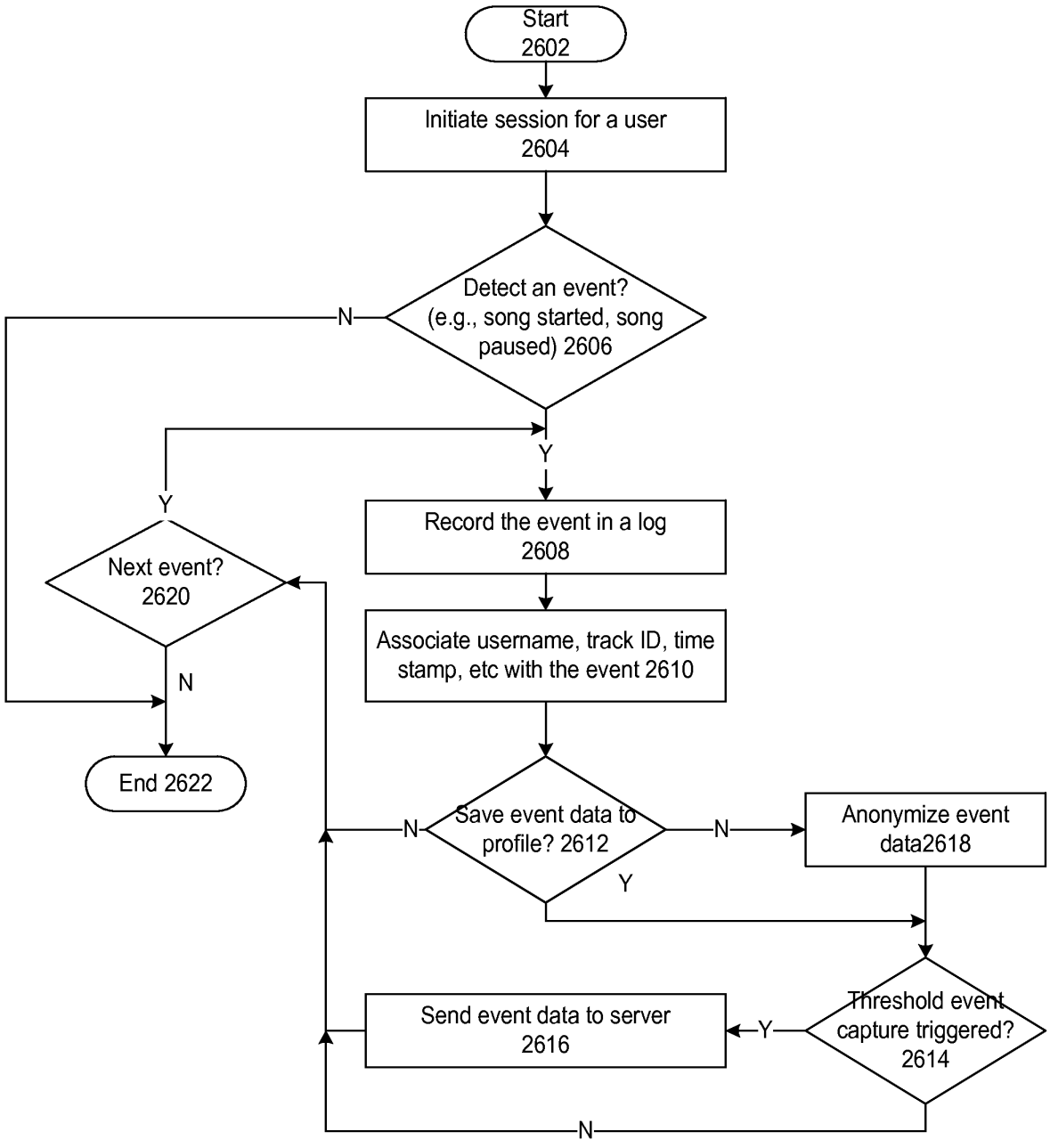

Start 2602
Initiate session for a user 2604
Detect an event? (e.g., song started, song paused) 2606
N
Y
Record the event in a log 2608
Associate username, track ID, time stamp, etc with the event 2610
Save event data to profile? 2612
N
Y
Anonymize event data2618
Threshold event capture triggered? 2614
Y
Send event data to server 2616
N
Next event? 2620
Y
N
End 2622

FIGURE 26a

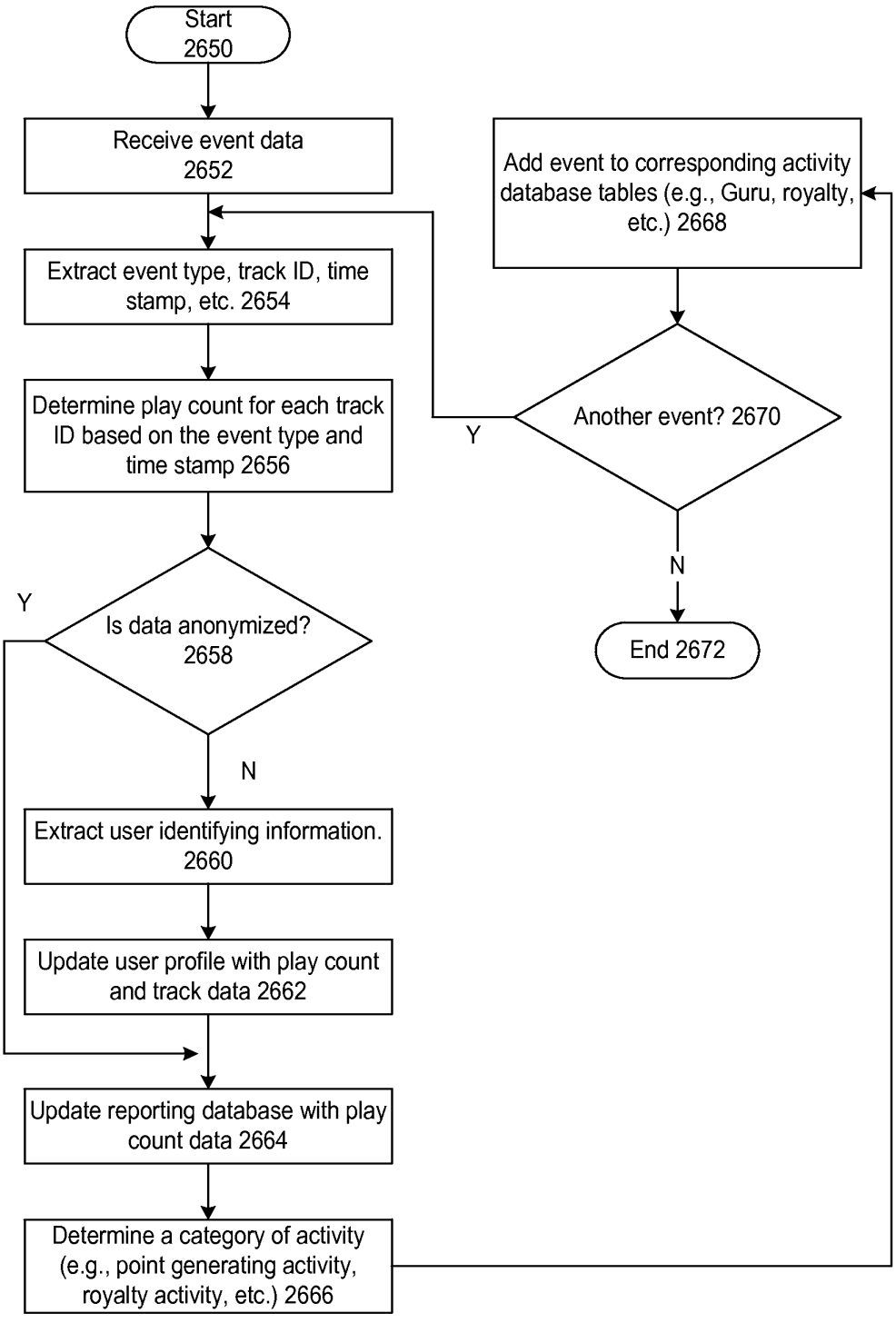

Start 2650
Receive event data 2652
Extract event type, track ID, time stamp, etc. 2654
Determine play count for each track ID based on the event type and time stamp 2656
Is data anonymized? 2658
Y
N
Extract user identifying information. 2660
Update user profile with play count and track data 2662
Update reporting database with play count data 2664
Determine a category of activity (e.g., point generating activity, royalty activity, etc.) 2666
Add event to corresponding activity database tables (e.g., Guru, royalty, etc.) 2668
Another event? 2670
Y
N
End 2672

FIGURE 26b

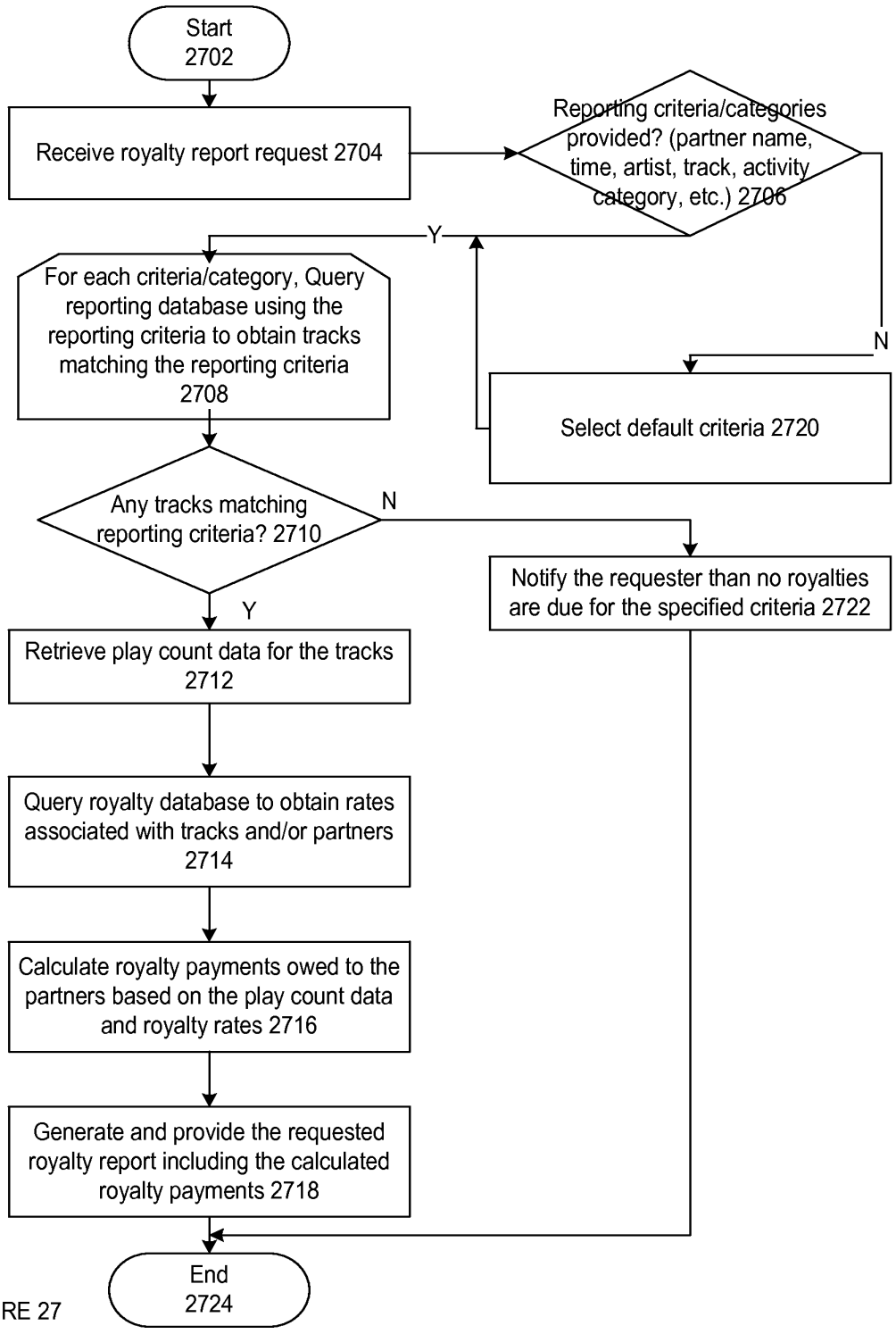
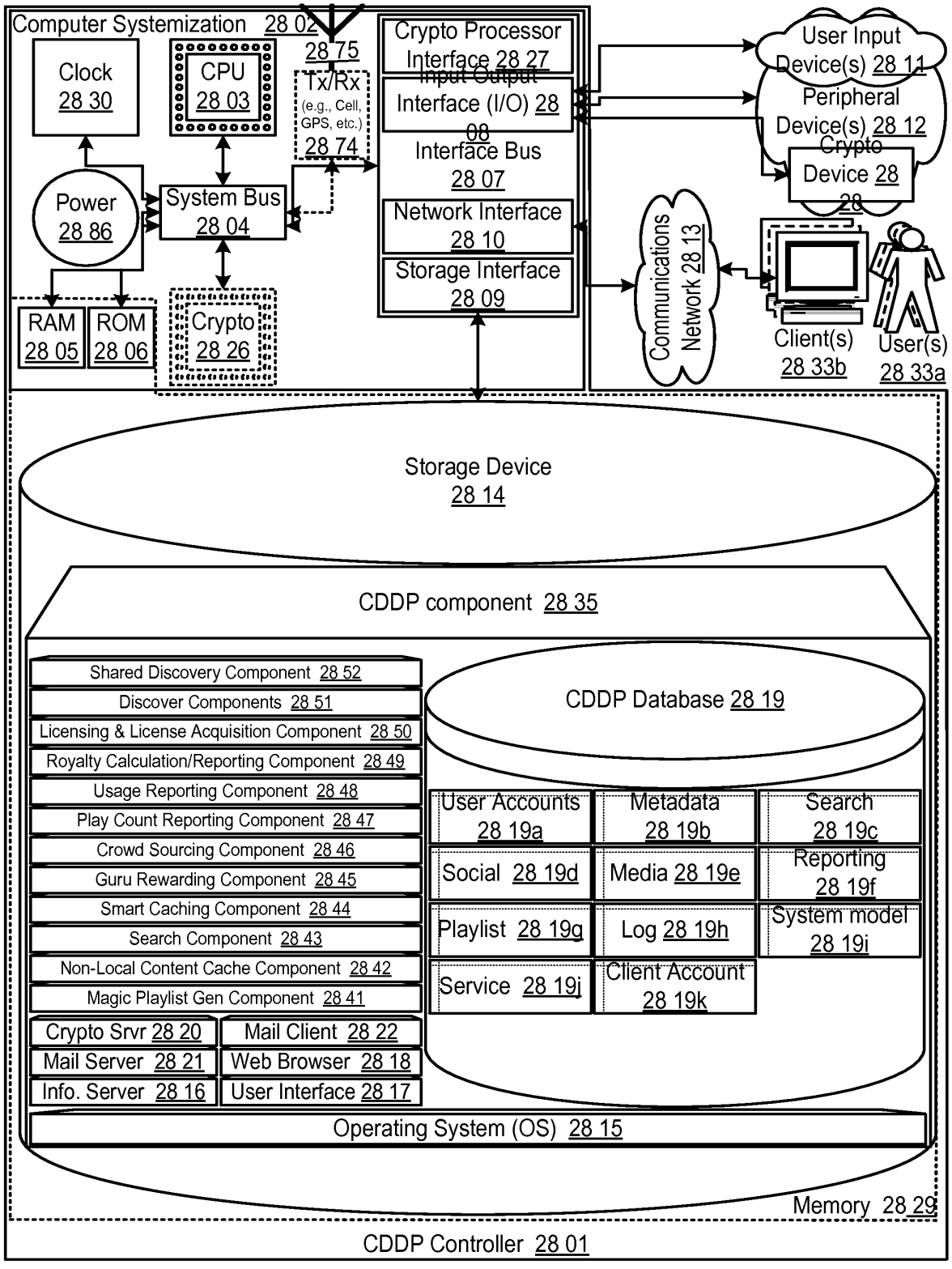

Start 2702
Receive royalty report request 2704
Reporting criteria/categories provided? (partner name, time, artist, track, activity category, etc.) 2706
Y
N
For each criteria/category, Query reporting database using the reporting criteria to obtain tracks matching the reporting criteria 2708
Select default criteria 2720
Any tracks matching reporting criteria? 2710
N
Y
Notify the requester than no royalties are due for the specified criteria 2722
Retrieve play count data for the tracks 2712
Query royalty database to obtain rates associated with tracks and/or partners 2714
Calculate royalty payments owed to the partners based on the play count data and royalty rates 2716
Generate and provide the requested royalty report including the calculated royalty payments 2718
End 2724

FIGURE 27


Computer Systemization 28 02
Clock 28 30
CPU 28 03
28 75
Tx/Rx (e.g., Cell, GPS, etc.) 28 74
Power 28 86
System Bus 28 04
RAM 28 05
ROM 28 06
Crypto 28 26
Crypto Processor Interface 28 27
Input Output Interface (I/O) 28 08
Interface Bus 28 07
Network Interface 28 10
Storage Interface 28 09
User Input Device(s) 28 11
Peripheral Device(s) 28 12
Crypto Device 28 28
Communications Network 28 13
Client(s) 28 33b
User(s) 28 33a
Storage Device 28 14
CDDP component 28 35
Shared Discovery Component 28 52
Discover Components 28 51
Licensing & License Acquisition Component 28 50
Royalty Calculation/Reporting Component 28 49
Usage Reporting Component 28 48
Play Count Reporting Component 28 47
Crowd Sourcing Component 28 46
Guru Rewarding Component 28 45
Smart Caching Component 28 44
Search Component 28 43
Non-Local Content Cache Component 28 42
Magic Playlist Gen Component 28 41
Crypto Srvr 28 20
Mail Client 28 22
Mail Server 28 21
Web Browser 28 18
Info. Server 28 16
User Interface 28 17
CDDP Database 28 19
User Accounts 28 19a
Metadata 28 19b
Search 28 19c
Social 28 19d
Media 28 19e
Reporting 28 19f
Playlist 28 19g
Log 28 19h
System model 28 19i
Service 28 19j
Client Account 28 19k
Operating System (OS) 28 15
Memory 28 29
CDDP Controller 28 01

**PATENT COOPERATION TREATY**

From the INTERNATIONAL BUREAU

# PCT

NOTIFICATION CONCERNING TRANSMITTAL OF COPY OF INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY (CHAPTER I OF THE PATENT COOPERATION TREATY)
(PCT Rule 44bis.1(c))

To:

GEORGE, Christopher N.
Hanley, Flight & Zimmerman, LLC.
150 S. Wacker Drive, Suite 2100
Chicago, Illinois 60606
ETATS-UNIS D'AMERIQUE

| | | |
|---|---|---|
| Date of mailing *(day/month/year)*<br>30 January 2014 (30.01.2014) | | |
| Applicant's or agent's file reference<br>11-0501-PCT | **IMPORTANT NOTICE** | |
| International application No.<br>PCT/US2012/045894 | International filing date *(day/month/year)*<br>09 July 2012 (09.07.2012) | Priority date *(day/month/year)*<br>19 July 2011 (19.07.2011) |
| Applicant<br>SONOS, INC. et al | | |

The International Bureau transmits herewith a copy of the international preliminary report on patentability (Chapter I of the Patent Cooperation Treaty)

| | |
|---|---|
| The International Bureau of WIPO<br>34, chemin des Colombettes<br>1211 Geneva 20, Switzerland | Authorized officer<br>Kihwan Moon |
| Facsimile No. +41 22 338 82 70 | e-mail: pt01.pct@wipo.int |

Form PCT/IB/326 (January 2004)

**PATENT COOPERATION TREATY**

# PCT

**INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY**
(Chapter I of the Patent Cooperation Treaty)

(PCT Rule 44*bis*)

| | | |
|---|---|---|
| Applicant's or agent's file reference<br>11-0501-PCT | **FOR FURTHER ACTION** | See item 4 below |
| International application No.<br>PCT/US2012/045894 | International filing date *(day/month/year)*<br>09 July 2012 (09.07.2012) | Priority date *(day/month/year)*<br>19 July 2011 (19.07.2011) |
| International Patent Classification (8th edition unless older edition indicated)<br>See relevant information in Form PCT/ISA/237 | | |
| Applicant<br>SONOS, INC. | | |

1. This international preliminary report on patentability (Chapter I) is issued by the International Bureau on behalf of the International Searching Authority under Rule 44 *bis*.1(a).

2. This REPORT consists of a total of 5 sheets, including this cover sheet.

   In the attached sheets, any reference to the written opinion of the International Searching Authority should be read as a reference to the international preliminary report on patentability (Chapter I) instead.

3. This report contains indications relating to the following items:

| | | |
|---|---|---|
| ☒ | Box No. I | Basis of the report |
| ☐ | Box No. II | Priority |
| ☐ | Box No. III | Non-establishment of opinion with regard to novelty, inventive step and industrial applicability |
| ☐ | Box No. IV | Lack of unity of invention |
| ☒ | Box No. V | Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement |
| ☐ | Box No. VI | Certain documents cited |
| ☐ | Box No. VII | Certain defects in the international application |
| ☐ | Box No. VIII | Certain observations on the international application |

4. The International Bureau will communicate this report to designated Offices in accordance with Rules 44*bis*.3(c) and 93*bis*.1 but not, except where the applicant makes an express request under Article 23(2), before the expiration of 30 months from the priority date (Rule 44*bis* .2).

| | |
|---|---|
| | Date of issuance of this report<br>21 January 2014 (21.01.2014) |
| The International Bureau of WIPO<br>34, chemin des Colombettes<br>1211 Geneva 20, Switzerland<br>Facsimile No. +41 22 338 82 70 | Authorized officer<br>Kihwan Moon<br>e-mail: pt01.pct@wipo.int |

Form PCT/IB/373 (January 2004)

# PATENT COOPERATION TREATY

From the
INTERNATIONAL SEARCHING AUTHORITY

To:
GEORGE CHRISTOPHER N.

HANLEY, FLIGHT & ZIMMERMAN, LLC. 150 S.
WACKER DRIVE, SUITE 2100 CHICAGO IL 60606 USA

# PCT

**WRITTEN OPINION OF THE INTERNATIONAL SEARCHING AUTHORITY**

**(PCT Rule 43bis.1)**

| | |
|---|---|
| Date of mailing *(day/month/year)* | **26 DECEMBER 2012 (26.12.2012)** |
| Applicant's or agent's file reference<br>11-0501-PCT | **FOR FURTHER ACTION**<br>See paragraph 2 below |

| International application No. | International filing date *(day/month/year)* | Priority date *(day/month/year)* |
|---|---|---|
| **PCT/US2012/045894** | **09 JULY 2012 (09.07.2012)** | 19 JULY 2011 (19.07.2011) |

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

***H04R 3/00(2006.01)i, H04R 5/02(2006.01)i, H04S 5/02(2006.01)i***

Applicant

**SONOS, INC. et al**

1. This opinion contains indications relating to the following items:

- ☒ Box No. I Basis of the opinion
- ☐ Box No. II Priority
- ☐ Box No. III Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
- ☐ Box No. IV Lack of unity of invention
- ☒ Box No. V Reasoned statement under Rule 43bis.1(a)(i) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
- ☐ Box No. VI Certain documents cited
- ☐ Box No. VII Certain defects in the international application
- ☐ Box No. VIII Certain observations on the international application

2. **FURTHER ACTION**

If a demand for international preliminary examination is made, this opinion will be considered to be a written opinion of the International Preliminary Examining Authority ("IPEA") except that this does not apply where the applicant chooses an Authority other than this one to be the IPEA and the chosen IPEA has notified the International Bureau under Rule 66.1bis(b) that written opinions of this International Searching Authority will not be so considered.

If this opinion is, as provided above, considered to be a written opinion of the IPEA, the applicant is invited to submit to the IPEA a written reply together, where appropriate, with amendments, before the expiration of 3 months from the date of mailing of Form PCT/ISA/220 or before the expiration of 22 months from the priority date, whichever expires later.
For further options, see Form PCT/ISA/220.

| Name and mailing address of the ISA/KR | Date of completion of this opinion | Authorized officer |
|---|---|---|
| Korean Intellectual Property Office<br>189 Cheongsa-ro, Seo-gu, Daejeon Metropolitan City, 302-701, Republic of Korea<br>Facsimile No. 82-42-472-7140 | 26 DECEMBER 2012 (26.12.2012) | JEONG, So Yeon<br>Telephone No.82-42-481-5656 |

Form PCT/ISA/237 (cover sheet) (July 2011)

**WRITTEN OPINION OF THE INTERNATIONAL SEARCHING AUTHORITY**

International application No.
**PCT/US2012/045894**

**Box No. I Basis of this opinion**

1. With regard to the **language**, this opinion has been established on the basis of :

   ☒ the international application in the language in which it was filed

   ☐ a translation of the international application into _____ , which is the language of a translation furnished for the purposes of international search (Rules 12.3(a) and 23.1(b))

2. ☐ This opinion has been established taking into account the **rectification of an obvious mistake** authorized by or notified to this Authority under Rule 91 (Rule 43*bis*.1(a))

3. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, this opinion has been established on the basis of:

   a. a sequence listing filed or furnished
      ☐ on paper
      ☐ in electronic form

   b. time of filing or furnishing
      ☐ contained in the international application as filed.
      ☐ filed together with the international application in electronic form.
      ☐ furnished subsequently to this Authority for the purposes of search.

4. ☐ In addition, in the case that more than one version or copy of a sequence listing has been filed or furnished, the required statements that the information in the subsequent or additioanl copies is identical to that in the application as filed or does not go beyond the application as filed, as appropriate, were furnished.

5. Additional comments:

**WRITTEN OPINION OF THE INTERNATIONAL SEARCHING AUTHORITY**

International application No.
**PCT/US2012/045894**

**Box No. V Reasoned statement under Rule 43bis.1(a)(i) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement**

1. Statement

| | | | |
|---|---|---|---|
| Novelty (N) | Claims | 1-30 | YES |
| | Claims | NONE | NO |
| Inventive step (IS) | Claims | 1-30 | YES |
| | Claims | NONE | NO |
| Industrial applicability (IA) | Claims | 1-30 | YES |
| | Claims | NONE | NO |

2. Citations and explanations :

Reference is made to the following documents:

D1: US 2008-0144864 A1 (GRAEME JOHN HUON) 19 June 2008
D2: US 05553147 A (JOSEPH E.M. PINEAU) 03 September 1996
D3: US 2007-0003067 A1 (STEFAN GIERL et al.) 04 January 2007
D4: US 2002-0124097 A1 (LARSON J. ISELY et al.) 05 September 2002

1. Novelty and Inventive Step

1.1 Concerning Claims 1-10

The subject matter of claim 1 differs from these prior art documents in that a method for shaping sound comprises configuring the playback device to reproduce a stereophonic or monaural sound using a plurality of speakers based on an orientation and an audio data stream. And it is not obvious to a person skilled in the art by the documents, taken alone or in combination. Therefore, claim 1 meets the requirements of PCT Article 33(2) and (3) with respect to novelty and inventive step.

Claims 2-10 are dependent on claim 1 and therefore meet the requirements of PCT Article 33(2) and (3).

1.2 Concerning Claims 11-20

The subject matter of claim 11 differs from these prior art documents in that a tangible computer readable storage medium including a set of instructions for execution by processor when executed implement a method for shaping sound comprises a playback device reproduces a stereophonic or monaural sound using a plurality of speakers based on an orientation and an audio data stream. And it is not obvious to a person skilled in the art by the documents, taken alone or in combination. Therefore, claim 11 meets the requirements of PCT Article 33(2) and (3) with respect to novelty and inventive step.

Claims 12-20 are dependent on claim 11 and therefore meet the requirements of PCT Article 33(2) and (3).

Continued on Supplemental Box

**Supplemental Box**

In case **the space in any of the preceding boxes is not sufficient.**
Continuation of :

Box V

1.3 Concerning Claims 21-30

Since the apparatus and the method of claims 21 and 1 are substantially same except the category aspect, claim 21 meets the requirements of PCT Article 33(2) and (3) with respect to novelty and inventive step.

Claims 22-30 are dependent on claim 21 and therefore meet the requirements of PCT Article 33(2) and (3).

2. Industrial Applicability

Claims 1-30 are industrially applicable under PCT Article 33(4).

PATENT COOPERATION TREATY

# PCT

## INTERNATIONAL SEARCH REPORT

(PCT Article 18 and Rules 43 and 44)

| Applicant's or agent's file reference | FOR FURTHER ACTION | see Form PCT/ISA/220 as well as, where applicable, item 5 below. |
|---|---|---|
| 11-0501-PCT | | |
| International application No. | International filing date *(day/month/year)* | (Earliest) Priority Date *(day/month/year)* |
| **PCT/US2012/045894** | **09 JULY 2012 (09.07.2012)** | 19 JULY 2011 (19.07.2011) |

Applicant

**SONOS, INC. et al**

This International search report has been prepared by this International Searching Authority and is transmitted to the applicant according to Article 18. A copy is being transmitted to the International Bureau.

This international search report consists of a total of 3 sheets.

☐ It is also accompanied by a copy of each prior art document cited in this report.

1. **Basis of the report**
   a. With regard to the language, the international search was carried out on the basis of:
      ☒ the international application in the language in which it was filed
      ☐ a translation of the international application into _____, which is the language of a translation furnished for the purposes of international search (Rules 12.3(a) and 23.1(b))
   b. ☐ This international search report has been established taking into account the rectification of an obvious mistake authorized by or notified to this Authority under Rule 91 (Rule 43.6*bis*(a)).
   c. ☐ With regard to any nucleotide and/or amino acid sequence disclosed in the international application, see Box No. I.
2. ☐ Certain claims were found unsearchable (See Box No. II)
3. ☐ Unity of invention is lacking (See Box No. III)
4. With regard to the title,
   ☒ the text is approved as submitted by the applicant.
   ☐ the text has been established by this Authority to read as follows:
5. With regard to the abstract,
   ☒ the text is approved as submitted by the applicant.
   ☐ the text has been established, according to Rule 38.2, by this Authority as it appears in Box No. IV. The applicant may, within one month from the date of mailing of this international search report, submit comments to this Authority.
6. With regard to the drawings,
   a. the figure of the drawings to be published with the abstract is Figure No. 1
      ☐ as suggested by the applicant.
      ☒ as selected by this Authority, because the applicant failed to suggest a figure.
      ☐ as selected by this Authority, because this figure better characterizes the invention.
   b. ☐ none of the figure is to be published with the abstract.

Form PCT/ISA/210 (first sheet) (July 2009)

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US2012/045894

A. CLASSIFICATION OF SUBJECT MATTER

*H04R 3/00(2006.01)i, H04R 5/02(2006.01)i, H04S 5/02(2006.01)i*

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)
H04R 3/00; G06F 15/16; H04R 5/02; H04R 5/00; H04H 5/00; H04R 29/00

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched
Korean utility models and applications for utility models
Japanese utility models and applications for utility models

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)
eKOMPASS(KIPO internal) & Keywords: speaker orientation, roll, pitch, frequency, rotation, stereophonic, monaural, shaping sound, sensor, accelerometer

C. DOCUMENTS CONSIDERED TO BE RELEVANT

| Category* | Citation of document, with indication, where appropriate, of the relevant passages | Relevant to claim No. |
|---|---|---|
| A | US 2008-0144864 A1 (GRAEME JOHN HUON) 19 June 2008<br>See abstract, paragraphs [0217],[0221],[0249],[0283], claim 165 and figures 1-10. | 1-30 |
| A | US 05553147 A (JOSEPH E.M. PINEAU) 03 September 1996<br>See abstract, claims 1,9 and figures 3-10. | 1-30 |
| A | US 2007-0003067 A1 (STEFAN GIERL et al.) 04 January 2007<br>See abstract, paragraphs [0013]-[0018] and claim 23. | 1-30 |
| A | US 2002-0124097 A1 (LARSON J. ISELY et al.) 05 September 2002<br>See abstract, claims 1,8 and figures 1-5. | 1-30 |

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

☒ See patent family annex.

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

| Date of the actual completion of the international search | Date of mailing of the international search report |
|---|---|
| 26 DECEMBER 2012 (26.12.2012) | **26 DECEMBER 2012 (26.12.2012)** |
| Name and mailing address of the ISA/KR<br>Korean Intellectual Property Office<br>189 Cheongsa-ro, Seo-gu, Daejeon Metropolitan City, 302-701, Republic of Korea<br>Facsimile No. 82-42-472-7140 | Authorized officer<br>JEONG, So Yeon<br>Telephone No. 82-42-481-5656 |

Form PCT/ISA/210 (second sheet) (July 2009)

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No.
PCT/US2012/045894

| Patent document cited in search report | Publication date | Patent family member(s) | Publication date |
|---|---|---|---|
| US 2008-0144864 A1 | 19.06.2008 | AU 2004-320207 A1 | 08.12.2005 |
| | | EP 1749420 A1 | 07.02.2007 |
| | | EP 1749420 A4 | 15.10.2008 |
| | | WO 2005-117483 A1 | 08.12.2005 |
| US 05553147 A | 03.09.1996 | CA 2162567 A1 | 24.11.1994 |
| | | CA 2162567 C | 10.04.2001 |
| | | CN 1055601 C | 16.08.2000 |
| | | CN 1126020 A | 03.07.1996 |
| | | CN 1126020 CO | 03.07.1996 |
| | | EP 0698334 A1 | 25.03.1998 |
| | | EP 0698334 B1 | 30.12.1998 |
| | | JP 02-961327 B2 | 06.08.1999 |
| | | JP 08-508150 A | 27.08.1996 |
| | | JP 2961327 B2 | 12.10.1999 |
| | | KR 10-0166662 B1 | 01.02.1999 |
| | | WO 94-27416 A1 | 24.11.1994 |
| US 2007-0003067 A1 | 04.01.2007 | DE 10110422 A1 | 19.09.2002 |
| | | EP 1241797 A2 | 18.09.2002 |
| | | EP 1241797 A3 | 05.10.2005 |
| | | US 2002-0146134 A1 | 10.10.2002 |
| | | US 7065217 B2 | 20.06.2006 |
| | | US 7889871 B2 | 15.02.2011 |
| US 2002-0124097 A1 | 05.09.2002 | None | |

Form PCT/ISA/210 (patent family annex) (July 2009)

# PATENT COOPERATION TREATY

From the
INTERNATIONAL SEARCHING AUTHORITY

To:
GEORGE CHRISTOPHER N.

HANLEY, FLIGHT & ZIMMERMAN, LLC. 150 S.
WACKER DRIVE, SUITE 2100 CHICAGO IL 60606 USA

# PCT

**WRITTEN OPINION OF THE INTERNATIONAL SEARCHING AUTHORITY**

**(PCT Rule 43bis.1)**

| | |
|---|---|
| Date of mailing *(day/month/year)* | **26 DECEMBER 2012 (26.12.2012)** |
| Applicant's or agent's file reference: 11-0501-PCT | **FOR FURTHER ACTION** See paragraph 2 below |

| International application No. | International filing date *(day/month/year)* | Priority date *(day/month/year)* |
|---|---|---|
| **PCT/US2012/045894** | **09 JULY 2012 (09.07.2012)** | 19 JULY 2011 (19.07.2011) |

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

***H04R 3/00(2006.01)i, H04R 5/02(2006.01)i, H04S 5/02(2006.01)i***

Applicant

**SONOS, INC. et al**

1. This opinion contains indications relating to the following items:

- [X] Box No. I Basis of the opinion
- [ ] Box No. II Priority
- [ ] Box No. III Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
- [ ] Box No. IV Lack of unity of invention
- [X] Box No. V Reasoned statement under Rule 43bis.1(a)(i) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
- [ ] Box No. VI Certain documents cited
- [ ] Box No. VII Certain defects in the international application
- [ ] Box No. VIII Certain observations on the international application

2. **FURTHER ACTION**

If a demand for international preliminary examination is made, this opinion will be considered to be a written opinion of the International Preliminary Examining Authority ("IPEA") except that this does not apply where the applicant chooses an Authority other than this one to be the IPEA and the chosen IPEA has notified the International Bureau under Rule 66.1bis(b) that written opinions of this International Searching Authority will not be so considered.

If this opinion is, as provided above, considered to be a written opinion of the IPEA, the applicant is invited to submit to the IPEA a written reply together, where appropriate, with amendments, before the expiration of 3 months from the date of mailing of Form PCT/ISA/220 or before the expiration of 22 months from the priority date, whichever expires later.
For further options, see Form PCT/ISA/220.

| Name and mailing address of the ISA/KR | Date of completion of this opinion | Authorized officer |
|---|---|---|
| Korean Intellectual Property Office<br>189 Cheongsa-ro, Seo-gu, Daejeon Metropolitan City, 302-701, Republic of Korea<br>Facsimile No. 82-42-472-7140 | 26 DECEMBER 2012 (26.12.2012) | JEONG, So Yeon<br>Telephone No.82-42-481-5656 |

Form PCT/ISA/237 (cover sheet) (July 2011)

WRITTEN OPINION OF THE
INTERNATIONAL SEARCHING AUTHORITY

International application No.
PCT/US2012/045894

**Box No. 1 Basis of this opinion**

1. With regard to the language, this opinion has been established on the basis of:

   ☒ the international application in the language in which it was filed

   ☐ a translation of the international application into _____, which is the language of a translation furnished for the purposes of international search (Rules 12.3(a) and 23.1(b))

2. ☐ This opinion has been established taking into account the rectification of an obvious mistake authorized by or notified to this Authority under Rule 91 (Rule 43*bis*.1(a))

3. With regard to any nucleotide and/or amino acid sequence disclosed in the international application, this opinion has been established on the basis of:

   a. a sequence listing filed or furnished
      ☐ on paper
      ☐ in electronic form

   b. time of filing or furnishing
      ☐ contained in the international application as filed.
      ☐ filed together with the international application in electronic form.
      ☐ furnished subsequently to this Authority for the purposes of search.

4. ☐ In addition, in the case that more than one version or copy of a sequence listing has been filed or furnished, the required statements that the information in the subsequent or additionl copies is identical to that in the application as filed or does not go beyond the application as filed, as appropriate, were furnished.

5. Additional comments:

WRITTEN OPINION OF THE
INTERNATIONAL SEARCHING AUTHORITY

International application No.
PCT/US2012/045894

**Box No. V Reasoned statement under Rule 43bis.1(a)(i) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement**

1. Statement

| | | | |
|---|---|---|---|
| Novelty (N) | Claims | 1-30 | YES |
| | Claims | NONE | NO |
| Inventive step (IS) | Claims | 1-30 | YES |
| | Claims | NONE | NO |
| Industrial applicability (IA) | Claims | 1-30 | YES |
| | Claims | NONE | NO |

2. Citations and explanations :

Reference is made to the following documents:

D1: US 2008-0144864 A1 (GRAEME JOHN HUON) 19 June 2008
D2: US 05553147 A (JOSEPH E.M. PINEAU) 03 September 1996
D3: US 2007-0003067 A1 (STEFAN GIERL et al.) 04 January 2007
D4: US 2002-0124097 A1 (LARSON J. ISELY et al.) 05 September 2002

1. Novelty and Inventive Step

1.1 Concerning Claims 1-10

The subject matter of claim 1 differs from these prior art documents in that a method for shaping sound comprises configuring the playback device to reproduce a stereophonic or monaural sound using a plurality of speakers based on an orientation and an audio data stream. And it is not obvious to a person skilled in the art by the documents, taken alone or in combination. Therefore, claim 1 meets the requirements of PCT Article 33(2) and (3) with respect to novelty and inventive step.

Claims 2-10 are dependent on claim 1 and therefore meet the requirements of PCT Article 33(2) and (3).

1.2 Concerning Claims 11-20

The subject matter of claim 11 differs from these prior art documents in that a tangible computer readable storage medium including a set of instructions for execution by processor when executed implement a method for shaping sound comprises a playback device reproduces a stereophonic or monaural sound using a plurality of speakers based on an orientation and an audio data stream. And it is not obvious to a person skilled in the art by the documents, taken alone or in combination. Therefore, claim 11 meets the requirements of PCT Article 33(2) and (3) with respect to novelty and inventive step.

Claims 12-20 are dependent on claim 11 and therefore meet the requirements of PCT Article 33(2) and (3).

Continued on Supplemental Box

**Supplemental Box**

**In case the space in any of the preceding boxes is not sufficient.**
Continuation of:

Box V

1.3 Concerning Claims 21-30

Since the apparatus and the method of claims 21 and 1 are substantially same except the category aspect, claim 21 meets the requirements of PCT Article 33(2) and (3) with respect to novelty and inventive step.

Claims 22-30 are dependent on claim 21 and therefore meet the requirements of PCT Article 33(2) and (3).

2. Industrial Applicability

Claims 1-30 are industrially applicable under PCT Article 33(4).

| Electronic Acknowledgement Receipt | |
|---|---|
| **EFS ID:** | 25237309 |
| **Application Number:** | 13864248 |
| **International Application Number:** | |
| **Confirmation Number:** | 5095 |
| **Title of Invention:** | SYSTEM AND METHOD FOR SYNCHRONIZING OPERATIONS AMONG A PLURALITY OF INDEPENDENTLY CLOCKED DIGITAL DATA PROCESSING DEVICES |
| **First Named Inventor/Applicant Name:** | Nicholas A. J. Millington |
| **Customer Number:** | 107361 |
| **Filer:** | Benjamin Michael Urban |
| **Filer Authorized By:** | |
| **Attorney Docket Number:** | 13-0401 (MBHB 15-517-CON) |
| **Receipt Date:** | 18-MAR-2016 |
| **Filing Date:** | 17-APR-2013 |
| **Time Stamp:** | 15:46:38 |
| **Application Type:** | Utility under 35 USC 111(a) |

## Payment information:

| Submitted with Payment | no |
|---|---|

## File Listing:

| Document Number | Document Description | File Name | File Size(Bytes)/ Message Digest | Multi Part /.zip | Pages (if appl.) |
|---|---|---|---|---|---|
| 1 | Information Disclosure Statement (IDS) Form (SB08) | 13-0401_MBHB15-517-CON_IDS.pdf | 1055888<br>aead8f3e2c485b69e798f0e4f812f271d2f127d9 | no | 7 |
| **Warnings:** | | | | | |
| **Information:** | | | | | |

| | | | | | |
|---|---|---|---|---|---|
| 2 | Foreign Reference | JP2002-111817_EFS.pdf | 1257794<br>3d40587cd556374f08d7a24dce1cd5341f42768c | no | 23 |
| **Warnings:** | | | | | |
| **Information:** | | | | | |
| 3 | Foreign Reference | JP2002123267A.pdf | 1142650<br>d973c970470e2f10394d4a717e65dc8a5bbbcd31 | no | 20 |
| **Warnings:** | | | | | |
| **Information:** | | | | | |
| 4 | Foreign Reference | JP2005-136457_EFS.pdf | 500771<br>6bd05fde776373b1e0285d145896f1c124e01ac4 | no | 13 |
| **Warnings:** | | | | | |
| **Information:** | | | | | |
| 5 | Foreign Reference | JP2007241652A.pdf | 757694<br>b11416f3d9a7b4362836f219a73539d2234a7da8 | no | 19 |
| **Warnings:** | | | | | |
| **Information:** | | | | | |
| 6 | Foreign Reference | JP2009-135750_EFS.pdf | 898894<br>56c3b9f4768ca88451df9e194ed0014a034bc1dd | no | 18 |
| **Warnings:** | | | | | |
| **Information:** | | | | | |
| 7 | Foreign Reference | JP2009506603.pdf | 1735260<br>c271278bf877a4edd6299ffa3ca942efd1b82069 | no | 26 |
| **Warnings:** | | | | | |
| **Information:** | | | | | |
| 8 | Foreign Reference | JP2009538006A.pdf | 780949<br>58eb6213f43d027560b2f620c1b0c79f46fff66c | no | 32 |
| **Warnings:** | | | | | |
| **Information:** | | | | | |
| 9 | Foreign Reference | JP2011-130496_EFS.pdf | 558338<br>0e00194241fac1e7fd7510c43a4b4c3704790df9 | no | 12 |
| **Warnings:** | | | | | |
| **Information:** | | | | | |
| 10 | Foreign Reference | WO2007023120A1.pdf | 1574651<br>e190d69e8ea31b006ac1311207c60121cd28b598 | no | 33 |
| **Warnings:** | | | | | |
| **Information:** | | | | | |

| | | | | | |
|---|---|---|---|---|---|
| 11 | Foreign Reference | WO2008114389.pdf | 1149796<br>504f681538790f754ba2b307b8e2fd4c7077457c | no | 27 |
| **Warnings:** | | | | | |
| **Information:** | | | | | |
| 12 | Foreign Reference | WO2012050927.pdf | 21146172<br>0cc60d7a591c6fc5361e2caf623289fdb5939baa | no | 386 |
| **Warnings:** | | | | | |
| **Information:** | | | | | |
| 13 | Non Patent Literature | 13871795_AA_02-10-2016.pdf | 199493<br>eff127b44da2d4c0ad3ae2167a6d29dc0fd0f1bd | no | 3 |
| **Warnings:** | | | | | |
| **Information:** | | | | | |
| 14 | Non Patent Literature | EP_SearchReport_13810340_3_03-07-2016.pdf | 305975<br>921d9e5c4cfbfe3cf521aa12e94c2763d841822c | no | 9 |
| **Warnings:** | | | | | |
| **Information:** | | | | | |
| 15 | Non Patent Literature | 13871795_Final_OA_02-24-2016.pdf | 919684<br>56cd03882a6726c686c523c8ec17cf5163d213ea | no | 28 |
| **Warnings:** | | | | | |
| **Information:** | | | | | |
| 16 | Non Patent Literature | Horwitz_Ref_2013.pdf | 1041654<br>4c8854b087257eb517c846c07539d1e9f510ad24 | no | 5 |
| **Warnings:** | | | | | |
| **Information:** | | | | | |
| 17 | Non Patent Literature | IPRP_PCTIB2012045894_01-30-14.PDF | 203266<br>7f11126a42ea767ff6a1811b6b35feb0afa162ef | no | 6 |
| **Warnings:** | | | | | |
| **Information:** | | | | | |
| 18 | Non Patent Literature | ISR_PCTUS2012045894_12-26-12.pdf | 94148<br>1b81a8f19df487d09e193d7b87d8badc0f7f6a52 | no | 3 |
| **Warnings:** | | | | | |
| **Information:** | | | | | |
| 19 | Non Patent Literature | PCTUS2012045894_Written_Opinion_12-26-12.pdf | 99988<br>b7a29f654e3f813d6d525b45740c4010bb46c87e | no | 4 |
| **Warnings:** | | | | | |
| **Information:** | | | | | |

| | | | | | |
|---|---|---|---|---|---|
| 20 | Non Patent Literature | Japanese_No_2015-520286_Office_Action_2-2-16.pdf | 175340<br>0e47d259cd9451558c346bb95eca9c679fee7cb5 | no | 6 |
| **Warnings:** | | | | | |
| **Information:** | | | | | |
| 21 | Non Patent Literature | Japanese_No_2014-521648_Rejection_Notice_2015-02-03.pdf | 316846<br>0acd94225b68c056cc806c5475d31f0e956a308d | no | 7 |
| **Warnings:** | | | | | |
| **Information:** | | | | | |
| 22 | Non Patent Literature | Roland_Ref_2011.pdf | 78782<br>299206975a7fa679355cd22aef307e89f51ada01 | no | 2 |
| **Warnings:** | | | | | |
| **Information:** | | | | | |
| | | | **Total Files Size (in bytes):** | 35994033 | |

**This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.**

**New Applications Under 35 U.S.C. 111**
**If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.**

**National Stage of an International Application under 35 U.S.C. 371**
**If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.**

**New International Application Filed with the USPTO as a Receiving Office**
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| Application Number | 13864248 |
| Filing Date | 2013-04-17 |
| First Named Inventor | NICHOLAS; A. J. Millington |
| Art Unit | 2442 |
| Examiner Name | SURVILLO, OLEG |
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## (54) Audio-video synchronizing

(57) A method and apparatus for synchronizing playback of audio and video frames from a program source associates an audio presentation time stamp ("PTS") value with an output audio frame. Selected ones of audio and video data packets include respective audio and video PTS values representing desired playback times of the respective audio and data associated therewith. The selected ones of the audio data packets further include audio frame numbers representing a number of output frames of audio to be played back between the selected ones of the audio data packets. The method comprises storing the audio and video PTS values in respective audio and video PTS tables (302, 304) during an audio demultiplexing process. In addition, the audio frame numbers are stored in frame counters (309) in association with respective PTS values during the demultiplexing process. Thereafter, the process sequentially decodes the audio and video input data to produce respective frames of audio and video which are presented to the user. With the presentation of each audio and video frame, the respective audio and video frame counters (309) are selectively decremented. Upon detecting one of the audio frame counters having a zero value, the audio PTS value for that zero value audio frame counter is retrieved. Thereafter, the playback of the audio and video frames is selectively modified so that frames of audio and video are played back in synchronization.

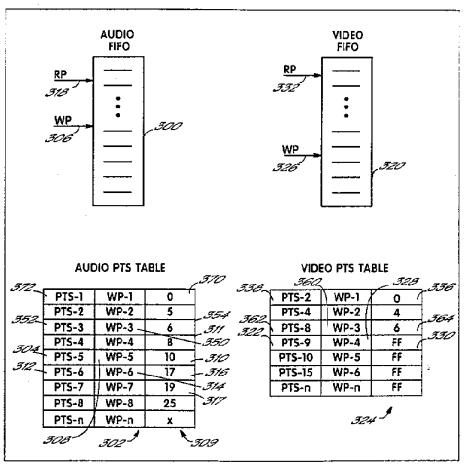



FIG. 4

EP 0 895 427 A2

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## Description

**[0001]** This invention relates to audio-video synchronizing. A preferred form of implementation of the invention described hereinbelow relates to the digital processing of video to be displayed on a television screen and, more particularly, to digitally synchronizing the audio and video being output to a video display.

**[0002]** Almost all televisions manufactured today are capable of interfacing with different sources of program materials, for example a VCR, a digital versatile or video disk ("DVD") player, cable, DSS, etc., that provide audio signals for creating sounds and associated video input signals for creating screen displays. Some of those sources provide digital audio and video input signals in accordance with the Moving Picture Expert Group MPEG-2 audio/video digital compression standard. Thus, contemporary televisions and/or DVD systems preferably have the capability of processing compressed digital input signals and providing digital output signals representing the desired images. Most often, those digital signals are converted to analog signals for use by known analog television display units.

**[0003]** The implementation of digital signal processing for providing a video display and associated audio from an audio-video source of program material presents numerous design challenges that were not encountered in the prior processing of analog audio and video signals. For example, with digital signal processing, the audio signals are separated from the video signals; and the audio and video are processed independently. However, the playback of the audio and video must be synchronized, so that there is a coordinated and coherent reproduction of the desired audio and video provided by the source of program material.

**[0004]** The program source preferably provides the audio and video data in respective data packets in an "MPEG-2" format. Each of the audio and video data pockets is received from the source of video material in a continuous data stream. Each packet of video data includes a header block followed by a data block. The data block may include any number, for example one to twenty, of frames of video data that may include a full field of video data or be a coded group of pictures that includes its own header block identifying the picture type and display order. The header block for a video data packet includes control information, for example, the identity of the format of the video data, the type of compression, if used, picture size, display order, and other global parameters. The audio data packet has a header block that again identifies the format of the audio data with instructions relating to how the audio data is to be decoded and processed to provide desired enhancements, if applicable. Following the header block, the audio data packet includes an audio data block that has any number of blocks or frames of audio data, for example, from one to approximately twenty blocks.

**[0005]** Selected ones of the header blocks of the audio and video data packets include a presentation time stamp ("PTS") value which is a time stamp that is applicable to that data packet. The PTS value is a time reference to a system time clock that was running during the creation or recording of the audio and video data. A similar system time clock is also running during the playback of the audio and video data, and if the audio and video data are played back at the times represented by their presentation time stamps, the audio and video data will be presented to the user in the desired synchronized manner. Therefore, the PTS is used to synchronize the presentation or playback of the audio and video data.

**[0006]** During the decoding of the audio data, it normally must be decompressed, reconstructed and enhanced in a manner consistent with the source of program material and the capabilities of the sound reproduction system. In some applications, audio data packets may contain up to six channels of raw audio data. Depending on the number of channels the sound reproduction systems can reproduce, for example, from two to six, the sound reproduction system selectively uses the channels of raw audio data to provide a number of channels of audio which are then stored in an audio FIFO.

**[0007]** The decoding of the video data normally requires decompression, conversion of partial frames into full frames and the recognition of full frames. Simultaneously with the decoding process, the frames of audio and video data are being output, that is, played back to the user; and that playback must be synchronized such that the frames of audio and video present a coordinated and coherent presentation.

**[0008]** As will be appreciated from the foregoing, demultiplexing the audio and video data pockets is a complex process of deconstructing the data packets and storing the necessary decoding instructions as well as the content data itself to permit the decoding and playback of the data in a synchronized manner. In accordance with one known technique the audio and video content data or raw data is stored in respective audio and video first-in, first-out ("FIFO") memories. The FIFOs have write and read pointers that are controlled by a memory controller, which, in turn, is under the general control of a CPU. The write pointers are driven as a function of the requirements of the demultiplexing process, which sequentially delivers data to each of the FIFOs. The read pointers are driven as a function of independent and parallel decoding processes, which sequentially read data from the FIFOs. In addition to loading the raw data into the FIFOs, the demultiplexing process sequentially writes the associated PTS values, if present, into memory locations in respective audio and video PTS tables. To associate the PTS values with data in the FIFOs, in addition to a PTS value, the location in the respective FIFO of the first byte of data received after the PTS, is typically written into the respective audio and video PTS table.

**[0009]** While the audio and video data is being loaded

into the FIFO memories by the demultiplexing process, audio and video data is simultaneously and in parallel being read from the respective FIFOs during audio and video decoding and playback processes. While both are occurring, a supervisory process must monitor the time synchronization of the video and audio data being produced by the video and audio decoding processes. In the known technique described above, this is done by relating the read pointers in the FIFOs, as they are driven by the decoding processes, to the memory locations stored in the PTS tables. When the read pointer is sufficiently close to a stored location associated with a PTS, it can be determined that the PTS identifies the current time of the associated decoding process. PTS values identified in this manner may be compared to determine whether one decoding process is ahead or behind of another.

**[0010]** Unfortunately, this approach has distinct disadvantages which arise from the fact that, during the audio and video decoding processes, the read pointers for the respective FIFOs are automatically and continuously driven by decoding processes interacting directly with the memory controller independent of any instructions from the CPU. This must be the case because the entire process of demultiplexing audio and video data, as well as decoding and outputting the data must occur continuously in a synchronized manner.

**[0011]** The above-described technique for synchronizing the audio and video decoding and playback processes presents a significant challenge, due to delays inherent in the interaction of the supervisory process with the various decoding processes. Considering, for example, the decoding of audio data, assume that the audio decoder delivers a start audio frame interrupt to the CPU running the supervisory process each time decoding of an audio frame commences. At the start of an audio frame, the supervisory process must associate the data currently being read from the audio FIFO with its corresponding presentation time stamp ("PTS"), that is, the PTS value that was loaded in the audio PTS table when the data currently being read was written into the audio FIFO. Theoretically, if the location of the read pointer at the beginning of the audio frame is known, that location can be compared with the write pointer locations that were stored in the PTS table during the demultiplexing process. If a correspondence between the current read pointer location and a stored write pointer location can be found, then the PTS associated with the stored write pointer corresponds to the PTS of the audio data currently being identified by the read pointer. If the PTS value for the data being read can accurately be determined, then the decoding and playback processes may be instructed in the known manner to skip or repeat frames in order to provide a synchronized output of frames of the audio and video.

**[0012]** However, there are two conditions which may result in the above process, on occasion, failing to achieve synchronization in the playback of the audio and video data. The first condition arises because the CPU running the supervisory process must time share between supervision of the audio and video decoding process, and the demultiplexing process. Accordingly, the CPU must respond to each supervised process using prioritized interrupt based communication scheme. Further, the CPU communicates with the memory controller and other functional units over a shared, time multiplexed communication bus or channel. Therefore, when a start audio frame interrupt is received by the CPU, it may not be processed immediately because the CPU is processing other interrupts of an equal or higher priority. Further, even if the CPU services the start audio frame interrupt immediately, it must then communicate with the memory controller over the time multiplexed bus. Access to the bus is arbitrated and the CPU may not have the highest priority. However, during the delay in first, processing the start audio frame interrupt and second, communicating with the memory controller over the time multiplexed bus, the decoding process for the audio data FIFO continues to read audio data from the FIFO. Therefore, when the start audio frame interrupt is serviced by the CPU and the CPU is able to communicate with the memory controller, the location of the audio data FIFO read pointer obtained by the CPU will normally be different from its location when the start audio frame interrupt was initially received by the CPU. Thus, when the CPU responds to the interrupt and obtains the current read pointer for the audio FIFO from the memory controller, the read pointer will no longer have the value it had at the time the interrupt was generated. Therefore, the result of the delay is some inaccuracy in the identity of read pointer location obtained by the CPU.

**[0013]** The second condition of concern is that the audio packets being read may be small and processed very quickly. Therefore, the PTS table may have two PTS entries with FIFO location values that are very close. Hence, when an inaccurate read pointer location is compared to the write pointer location values in the PTS table, an incorrect PTS entry may be associated with the start of the audio frame being decoded. Thus, there will arise a small loss of synchronization between the presentation of the audio and video frames. A single occurrence of the above event might not be detectable by the user. However, if the time to service start audio frame interrupt is longer and the processing time required for the audio data packet is very short, or if several such audio data packets occur successively, the loss of synchronization may be greater. Furthermore, the loss of synchronization in the audio process is cumulative of losses of synchronization in other decoding processes. Thus, accumulated loss of synchronization can occur to the point where the loss of synchronization is disturbing or perceptible to the user.

**[0014]** Consequently, in a system such as that described above, there is a need to improve the association of stored PTS values (stored, for example, in PTS tables) with the audio and video data being read from

storage (for example from respective FIFO memories) during the decoding process.

**[0015]** First to third aspects of the present invention are set forth in claims 1, 32 and 33 hereof, respectively.

**[0016]** A preferred form of implementation of the present invention described hereinbelow provides a method and apparatus for improving the synchronization of the playback of the audio and video frames from a program source. The preferred form of implementation of the invention has the further advantage of providing a wide range of flexibility with respect to how the synchronization is implemented. Either the playback of the audio or the playback of the video may be used as a master to which the other is synchronized. In another embodiment, the system time counter is the master and the playback of the frames of audio and video are independently synchronized to the system time counter.

**[0017]** In accordance with the principles of the present invention and in accordance with the described embodiments, a method is described for associating an audio presentation time stamp ("PTS") value with an output audio frame that is a part of the sequence of audio frames that are derived from demultiplexing and decoding audio input data in respective audio data packets. The frames of audio are played back with frames of video being a part of a sequence of frames of video derived by multiplexing and decoding video data in respective video data packets. Selected ones of the audio and video data packets include respective audio and video PTS values representing desired playback times of the respective audio and data associated therewith. The selected ones of the audio data packets further include audio frame numbers representing a number of output frames of audio to be played back between the selected ones of the audio data packets. The method comprises the steps of first storing the audio and video PTS values in respective audio and video PTS tables during an audio demultiplexing process. In addition, the audio frame numbers are stored in frame counters in association with respective PTS values during the demultiplexing process. Thereafter, the method sequentially decodes the audio and video input data to produce respective frames of audio and video which are presented to the user. With the presentation of each audio frame, the audio frame counters are selectively decremented upon detecting one of the audio frame counters having a zero value, the audio PTS value for that zero value audio frame counter is retrieved. Thereafter, the playback of the audio and video frames is adjusted so that they are played back in synchronization.

**[0018]** In one aspect of the invention, the playback of the frames of audio is selected to be the master with which the playback of frames of video is synchronized. In that mode, the process establishes an audio clock extension for a system time counter. The audio clock extension has a value equal to the difference between audio PTS value associated with the zero audio frame counter and the current value of a system time counter. Thereafter, the current state of the system time counter is adjusted by the audio clock extension, thereby bringing the system time counter into synchronization with the playback of frames of audio.

**[0019]** In another aspect of the invention, video PTS values contained in selected ones of the video data packets are stored during a demultiplexing process. Thereafter, at the start of a video decoding process, a number of video frames corresponding to the duration of the video decoding process is stored in respective video frame counters. Upon presenting each of the frames of video, selected ones of the video frame counters are decremented. Upon detecting a video frame counter having a zero value, the system checks to determine whether the video PTS value associated with the zero value video frame counter is equal to the current state of the system time counter plus the audio clock extension. If there is a correspondence between the video PTS value and the value of the system time counter plus the audio clock extension, the audio and video frames are being presented in a synchronized manner.

**[0020]** In accordance with the further aspect of the invention, if the video PTS values is greater than the value of the current state of the system time counter plus the audio clock extension, the video frames are being presented too fast, and a frame of video is repeated to bring it into closer synchronization with the presentation of the frames of audio.

**[0021]** In a still further aspect of the invention, the system determines whether the video PTS value associated with the zero value frame counter is less than the value of the current state of the system time counter plus the audio clock extension. That condition indicates that the frames of video are being presented too slowly with respect to the presentation of the frames of audio, and a subsequent frame of video is skipped, thereby bringing the presentation of the frames of video into closer synchronization with the presentation of the frames of audio.

**[0022]** In accordance with the further embodiment of the invention, the presentation of frames of video is selected to be the master with which the presentation of the frames of audio is synchronized. In that embodiment, a video clock extension to the system time counter is determined as a function of the difference of the video PTS value associated with the video frame counter having a zero value and the current state of the system time counter. In this embodiment, in a manner similar to that described above, an audio PTS value associated with an audio frame counter having a zero value is compared to the current state of the system time counter plus the video clock extension as determined from the video PTS value. If the audio PTS value greater than the current state of the system time counter plus the video clock extension, the audio is being presented too fast with respect to the frames of video; and therefore, a frame of audio is repeated to bring the presentation of audio and video into closer synchronization.

**[0023]** Similarly, in a further aspect of this embodiment, if it is determined that the audio PTS value associated with the zero audio frame counter is less than the current state of the system time counter plus the video clock extension, the audio is being presented too slow with respect to the video and a subsequent frame of audio is skipped, thereby bringing the audio and video presentations into closer synchronization.

**[0024]** In a still further embodiment of the invention, neither the playback of audio frames or the playback of video frames is chosen as a master, and thus, no clock extension is determined. Instead the playback of audio and video is compared to the system time counter, and both the audio and the video are independently adjusted by repeating or skipping frames as required to maintain a correspondence to the system time counter. The above methods provide significant flexibility in synchronizing the playback of audio and video frames.

**[0025]** The invention will now be further described, by way of illustrative and nonlimiting example, with reference to the accompanying drawings, in which:

**[0026]** Fig. 1 is a schematic block diagram of only those portions of a television utilizing a digital audio-video processor in accordance with the principles of the present invention.

**[0027]** Fig. 2 is a flow chart illustrating the steps of a portion of the demultiplexing process executed by the demultiplexer in accordance with the principles of the present invention.

**[0028]** Fig. 3 is a flow chart illustrating the steps of a portion of the demultiplexing process executed by the CPU in accordance with the principles of the present invention.

**[0029]** Fig. 4 is a schematic block diagram illustrating audio and video FIFOs and tables within the memory of the processor utilized in executing the audio and video processing as illustrated in Fig. 2.

**[0030]** Fig. 5 is a flow chart illustrating the steps of a portion of an audio decoding process executed by the CPU in accordance with the principles of the present invention.

**[0031]** Fig. 6 is a flow chart illustrating the steps of a portion of a video decoding process executed by the CPU in accordance with the principles of the present invention.

**[0032]** Fig. 7 is a flow chart illustrating the steps of portion of a process executed by the CPU for playing back output frames of audio data in accordance with the principles of the present invention.

**[0033]** Fig. 8 is a flow chart illustrating the steps of a portion of a process executed by the CPU for playing back output frames of video data in accordance with the principles of the present invention.

**[0034]** Referring to Fig. 1, a television 18 contains a digital audio/video processor 20 that receives on input 22 a continuous serial stream of data packets containing the audio and video information required to create the desired video images. The audio and video data may be provided by any one of several devices, for example, a VCR or DVD player, cable, a DSS receiver, a menu display commanded within the television 18, etc; and the video information may be supplied in any one of several different formats. Normally, the audio and video data packets are provided in the MPEG-2 format.

**[0035]** The audio and video data packets are received and demultiplexed continuously in independent parallel data streams. Further, the decoding and playback of output frames of audio and video data is also performed continuously in parallel data streams independent of the demultiplexing processes. Further, demultiplexing is a process that varies significantly in real time, depending on the nature of audio and video data being received. In addition, the number of video frames to be presented and their order of presentation cannot be determined from the raw video data being received. The creation of video frames and their order of presentation is a function of the decoding process and is determined primarily by the control data in the header portion of the video data packet. Similarly, the raw audio data being received in the data packet bears little resemblance to the audio data output and presented, and the frames of audio data to be presented are created during the decoding process of the audio data.

**[0036]** Finally, it should be noted that output audio frames can be of any length in real time, and further, several audio frames may be associated with single video frame, or in contrast, a single audio frame may be presented during video produced by several video frames. However, it is required that the frames of audio and video be played back in a synchronized manner to provide a coordinated and coherent presentation to the user. To facilitate the coordination of the presentation of the frames of audio and video data, selected ones of the audio and video data packets contain a presentation time stamp "PTS", which is a time reference to a system counter that was running during the creation or recording of the audio and video data. A similar system time counter is running in the CPU 26 during the decoding and playback of the frames of audio and video, and audio and video PTS tables are created during the demultiplexing process. If there is perfect synchronization, when the frames of audio and video are output, their stored PTS values will be the same as the current state of the system time counter. However, the differences in the processing of the audio and video data in separate parallel bit streams does not facilitate such precise timing control. Therefore, for that and other reasons, the playback of the frames of audio and video may lose synchronization with the system time counter. The net result is a loss of synchronization in the audio and video being played back to the user.

**[0037]** Fig. 2 is a flow chart illustrating the general operation of the demultiplexer 19 of Fig. 1. At 202, the input 22 to the multiplexer 19 continuously receives an input bit stream of data containing in random order, audio, video and subpicture data packets. The header block of

data is extracted at 204, and video data packets are identified at 206. A video demultiplexing interrupt is provided at 208 to the CPU 26 (Fig. 1); and at 210, the video data is sequentially stored in a video data first-in, first-out ("FIFO") buffer 320 (Fig. 4) in memory 24. In a similar process, audio data packets are identified at 212, and an audio demultiplexing interrupt is provided at 214 to the CPU 26. At 216, the video data is sequentially stored in a video data FIFO buffer 300 (Fig. 4) in memory 24 (Fig. 1). Subpicture data packets are identified at 218, and a subpicture demultiplexing interrupt is provided at 220 to the CPU 26. At 222, the subpicture data is sequentially stored in a subpicture FIFO buffer (not shown) in memory 24. While the demultiplexer 19 performs other processing, it does not relate to the synchronization of the audio and video and therefore, will not be further described.

**[0038]** The demultiplexing process continues in the CPU 26 as illustrated in Fig. 3, and Fig. 4 is a schematic representation of how various portions of audio and video data are partitioned in the memory 24 (Fig. 1). In addition to the audio and video data FIFOs 300, 320 (Fig. 4), the memory 24 includes audio and video PTS tables 302, 324. Referring to Fig. 3, at 250, the CPU 26 services the interrupt from the demultiplexer 19 and determines at 252 whether the interrupt is for an audio PTS interrupt. If so, at 254, the PTS value in the header block of the audio data packet is loaded into audio PTS table 302, for example, at location 304. Further, the location of the write pointer 306 of the FIFO 300 associated with the location of the first byte of audio data loaded in the FIFO 300 is stored in the audio PTS table 302, for example, at location 308.

**[0039]** As previously mentioned, a PTS is only provided with selected audio data packets, however, those same audio data packets also contain, in their header data, a field having an audio frame number representing the number of frames of audio data to be output between the current PTS in the current audio data packet and the next audio data packet containing a PTS value. Further, the audio PTS table 302 includes frame counters, for example, memory locations at 309. And, during the demultiplexing of an audio data packet having a PTS value, that PTS value is loaded into an appropriate memory location, for example, memory location 304. Further, the number of audio frames until the next PTS value is added to the count in the corresponding frame counter, that is, frame counter 310, and the sum is written into the frame counter associated with the next PTS, that is, frame counter 316. For example, if, in the header block for the PTS loaded in memory location 304, the number of frames to the next audio data packet with a PTS is 7, that number, 7, is added to the current count, 10, in frame counter 310; and the sum, 17, is written the counter location 316 to be associated with the next audio data packet having a PTS value.

**[0040]** As will subsequently be explained, while the audio demultiplexing process is being executed, the process of decoding and playing back output audio frames is also running simultaneously and in parallel with the demultiplexing process. Further, with the output of each audio frame, the audio playback process decrements all of the frame counters in the audio PTS table 302. Therefore, when the count for the next PTS is loaded into location 316, the count loaded into location 310 most probably has been decremented from its original value. Consequently, as will be appreciated, the values in the frame counters 309 of the audio PTS table 302 are continuously changing as audio data packets are being demultiplexed and audio data is written into the FIFO 300, and in a simultaneously running parallel process, the audio data is also being read from the FIFO 300, decoded into output audio frames and output to the user.

**[0041]** If, at 256 of Fig. 3, the CPU 26 determines whether the interrupt is for a video PTS. If so, at 258, the video PTS value is sequentially stored in video PTS table 324 (Fig. 4) at, for example, location 322. Further, the location of the write pointer 326 of the video FIFO 320 when it stores the first byte of video data for that packet is written into video PTS table 324, for example, at location 328. The video PTS table 324 also has a frame counter, and during the demultiplexing process, the CPU sets a frame counter location, for example, location 330, associated with the PTS in location 322, to a non-functional value, for example, FF in hexadecimal notation.

**[0042]** If, at 260 of Fig. 3, the CPU determines that the interrupt is for a subpicture PTS; at 262, the CPU stores the subpicture PTS into an internal register (not shown). A PTS value is included with every subpicture data packet, and the corresponding subpicture is output when the system time clock equals the stored PTS. As subpicture synchronization is not as critical as audio/video synchronization, processing of the subpicture data will not be discussed further.

**[0043]** After servicing a demultiplexing interrupt, the demultiplexing process as described with respect to Figs. 1-4 continues in a similar manner. Raw audio data in the next audio data packet is sequentially loaded into the audio FIFO 300. If the next audio data packet does not have a PTS in its header block, a PTS entry is not made to the audio PTS table 302. If, however, the next audio data packet contains a PTS, that PTS is written into table 302, for example, at location 312. The write pointer location at which the write pointer 306 loads the first audio data for the current audio data packet into FIFO 300 is loaded into location 314. In addition, the number of frames of audio data between the current PTS and the next PTS is added to the count in counter location 316 and loaded into the frame counter location 317. Further, with each successive video data packet, the raw video data is sequentially loaded in the video FIFO 320; and if appropriate, PTS values are loaded in the video PTS table 324 with the respective write pointer locations. The demultiplexing process of the audio, vid-

eo and subpicture data packets proceeds in the same sequential manner to load the respective FIFOs and PTS tables with the appropriate data.

**[0044]** As will be appreciated, during the demultiplexing process, data is written into the respective audio and video FIFOs 300, 320 as a function of the requirements of the demultiplexing process. Further, during the demultiplexing process, the PTS values are disassociated with their respective audio and video data and stored in the respective PTS tables 302, 324. In simultaneous, independent and parallel processes, the audio and video data is read from the FIFOs 300, 320, decoded in respective audio and video decoders 25, 23 (Fig. 1) and output to the user. During the decoding process, the read pointers 318, 332 of the respective audio and video FIFOs 300, 320 are being moved automatically and continuously by a controller in the memory 24; and hence, the read pointers are not normally controlled by specific instructions from the CPU. In order to synchronize the playback of frames of audio and video data, during the decoding process, the streams of audio and video data being read from the respective FIFOs 300, 320 must be reassociated with the appropriate PTS values stored in the audio and video PTS tables 302, 324.

**[0045]** The audio decoding process is initiated by the audio decoder 25 (Fig. 1) detecting the extraction of the head block at 202 of Fig. 2. The audio decoder 25 then provides an audio decode interrupt to the CPU 26 and begins the process of decoding the next audio data packet. When the audio decoder 25 provides the audio decode interrupt to the CPU 26, the continuously moving read pointer 318 (Fig. 4) is identifying the current location from which the audio decoder is reading data from the FIFO 300. However, the CPU 26 must process a great number of interrupts, each having a different priority and a different real time requirement. Therefore, if the CPU 26 is processing interrupts having a higher priority than the audio decoder interrupt, there is a delay before the audio decoder interrupt can be serviced. Further, the CPU communicates with a memory controller in memory 24 and other functional units over a shared, time multiplexed communication bus or channel 29. Access to the bus is arbitrated, and the CPU may not have the highest priority. However, during the delay in first, processing the start audio frame interrupt and second, communicating with the memory controller over the time multiplexed bus 29, the audio decoder 25 is continuing to read audio data from the audio FIFO 300, and the read pointer 318 is continuously moving.

**[0046]** Eventually, at 400 of Fig. 5, the CPU services the audio decode interrupt; and at 402, the CPU 26 reads the current location value of the read pointer 318. However, the current location of the read pointer 318 is different from the location of the read pointer 318 when the audio decode interrupt was first provided to the CPU 26. Next, at 404, the CPU 26 scans all of the write pointer locations stored in the audio PTS table 302 to find a write pointer value that is closest to the current read pointer value, for example, at location 350 (Fig.4). The closest write pointer value is then subtracted at 408 from the current read pointer value, and the difference is tested at 410 against a maximum allowable difference value. The maximum allowable difference value is a function of the expected motion of the read pointer 318 during a maximum time delay of the CPU 26 in responding to the audio decode interrupt at 400.

**[0047]** If, at 410, the difference between the closest write pointer value in location 350 and the current read pointer value is equal to or greater than the maximum allowable difference value, it is concluded that there is no PTS value, including the PTS value in location 352 of table 302, associated with the audio data currently being read by the read pointer 318. If, at 410, the difference is less the maximum allowable difference value, the PTS value in location 352 associated with the identified write pointer value in location 350 is determined to be associated with the audio data being currently read by read pointer 318.

**[0048]** Then, at 412, the value in the frame counter 354 associated with the closest read pointer value in location 350 is evaluated to determine whether it is approximately equal to the duration or time, that is, the length, of the audio decoding process as measured in terms of number of audio frames. The real time required to decode frames of audio data can be predicted with reasonable accuracy. Further, that period of decoding time can also be calibrated or dimensioned in terms of the number of audio frames of data being decoded. Since the frame counters are decremented with each frame of audio data being output, it can be expected that the frame counter value will be equal to the number of audio frames of decoder delay. Therefore, if the value in the counter location 354 of the PTS table 302 is approximately equal to the expected delay in decoding the current audio data, at the end of that decoding process, the audio data being played back should correspond to the PTS value in the table 302 that has a zero counter value.

**[0049]** However, it is possible that during the decoding process a bit error occurs, and therefore, at 412, it will be determined that the counter value is not approximately equal to the number audio frames of the duration of the audio decoding process. In that event, at 414, the counter value in location 354 is modified and set to the number of audio frames of decoder delay. Hence, with each iteration through the process, any erroneous value in one of the frame counters can be detected and corrected. Alternatively, in addition to changing the value in the one frame counter, the values in the other frame counters below location 354 in the audio PTS table 302 are modified by the same incremental modification that was made to the counter location 354. In summary, during the multiplexing process, the PTS value was disassociated from the audio data in the FIFO 300; but the CPU responds to interrupts during the decoding by re-establishing the association between audio data being

read from the FIFO 300 and PTS values in the audio PTS table 302.

**[0050]** Referring to Fig. 6, the video decoding process runs independently, continuously and in parallel with the audio decoding process as well as the video demultiplexing process. The audio decoder 25 (Fig. 1) initiates the audio decoding process; however, in contrast, the CPU 26 initiates the video decoding process. At 500 of Fig. 6, the CPU detects video header that was extracted from the video data packet at 204 of Fig. 2. Thereafter, the video decoding process is functionally similar to the audio decoding process, and at 502, the CPU must read the current location of the read pointer 332 (Fig. 4) of the video FIFO 320. As previously described, this operation is subject to delays encountered in the CPU 26 (Fig. 1) accessing the memory controller in memory 24 over the multiplexed communication bus 29 connected therebetween. Therefore, the read pointer 332 associated with the video data FIFO 320 will have moved from the point in time at which the CPU provided an instruction to read the pointer location and the point in time at which the current read pointer is identified by the CPU. Thereafter, at 506, the CPU finds the closest write pointer in the video PTS table 324, for example, the write pointer in location 360 corresponding to the value of the read pointer location. The difference between the values of current read pointer location and closest write pointer location is determined at 508, and at 510, that difference is compared to a maximum value. As with the audio decoding process, the maximum value is a function of the delay in the CPU 26 determining the current location of the read pointer 332.

**[0051]** If the difference is equal to or exceeds the maximum value it is concluded that the video data associated with the current value of the read pointer does not have a corresponding PTS value stored in the video table 324. However, if the difference between the values of the closest write pointer and the current read pointer values is less than the maximum value, the PTS value in location 362 associated with the closest write pointer value in location 360 is determined to be associated with the video data being read by the read pointer 332. Further, at 512, the counter value at location 364 of the video PTS table 324 is set to a value equal to the delay in the video decoding process as measured in terms of the number of frames of video data being decoded. As with the audio data, the real time required to decode the video data is predictable with reasonable accuracy. Further, the time required to process the video data associated with the current location of the read pointer can be calibrated or dimensioned in units corresponding to the number of frames of video data Therefore, the number frames of video data expected to be processed through the video decoder 23 prior to the video data associated with the current position of the read pointer being played back from the video decoder is loaded in the counter location 364 of the video PTS table 324. Thereafter, at 514, the CPU 26 provides a command to the video decoder 23 to initiate the video decoding process.

**[0052]** As described above, audio and video data is being continuously read from the respective audio and video FIFOs 300, 320 (Fig. 4); and the read data is being continuously but independently processed in parallel by the respective audio and video decoders 25, 23 (Fig. 1). During the audio decoding process, the audio decoder 25 will create an audio frame that is ready to be output to the user. At that time, the audio decoder 25 provides an audio frame interrupt to the CPU 26 and thereafter, immediately proceeds to start the playback of the audio frame. Referring to Fig. 7, the CPU 26 at 600 services the audio frame interrupt, and at 602, proceeds to decrement by one all of the frame counters 309 in the audio PTS table 302 (Fig. 4). Next at 604, the CPU 26 determines whether any frame counter state is equal to zero. If a zero value is found, for example, in counter location 370, the CPU 26 then at 606 retrieves the audio PTS value associated with the zero counter value, for example, from memory location 372.

**[0053]** When a counter state is found to be zero, the CPU 26 at 608, then determines whether the audio has been selected to be the master. There are several different approaches to providing audio/video synchronization. As earlier described, a system time counter is running in the CPU 26 during the playback of the audio and video frames. If there is perfect synchronization, when the frames of audio and video are output, their stored PTS values will be the same as the current state of the system time counter. However, during playback, either one of the audio or video streams of output frames may lose synchronization with the system time counter and hence, with each other. One approach to synchronization is to choose the audio to be a master and synchronize the video to the audio. A second approach is to choose the video to be a master and synchronize the audio to the video. A third approach is to synchronize both the audio and video to the system time counter. There are perceived advantages and disadvantages to each approach depending on the source of program material, the format of the program material, other capabilities of the audio/video processor, etc. Normally, the selection of an audio, video or no master is a system parameter that may be selected by the manufacturer of the television unit. Alternatively, the selection could also be provided to the user. In other applications, the master could be dynamically chosen by the audio/video processor.

**[0054]** If at 608 of Fig. 7, the CPU 26 determines that the audio is the master, the CPU creates at 610 an extension or offset for the system time counter equal to the difference between the current value of the system time counter and the PTS value associated with the zero counter value, that is, for example, the PTS value in table location 372. This system time clock extension is used in synchronizing video, as discussed below. If at 608, the CPU determines that the audio is not the master, then at 612, the CPU determines whether the PTS

value associated with the PTS table counter having a zero value is within a certain range of the current value of the system counter added to the current system time clock extension. If video master mode is used, the video playback process will create and update values for the system time clock extension (in a manner similar to that described above at 608 with respect to the audio master). However, if neither the audio or the video is chosen as master, the system time clock extension will have a zero value. In step 612, the selected PTS is compared to the current value of the system time clock, added to the system time clock extension, plus a constant, limit factor. For the audio, the magnitude of the limit factor is approximately equal to the delay of the CPU in responding the PTS interrupt as well as the delay in communicating with the memory controller plus an acceptable degree of error in audio-video synchronization.

**[0055]** If at 612, the PTS value from the PTS table 302 is greater than the current value of the system time counter plus its extension and plus the limit factor, that means that the audio frames are being played back faster or ahead of when the system is expecting them to be played back. Thus, there is an apparent loss of synchronization between the audio frame and the video frame being presented. To correct that loss of synchronization, the CPU 26 at 614 provides instructions to the audio decoder 25 to repeat an audio frame. Repeating an audio frame while permitting the video frames to proceed through their natural progression permits the audio frames to slide back in time and regain their synchronization with the video frames.

**[0056]** If the comparison at 612 is negative, the CPU 26 then at 616 determines whether the PTS value from the PTS table 302 is less than the current value of the system time counter plus its extension and minus the limit factor. If so, that means that the audio frames are being played back slower or behind of when the system time counter is expecting them to be played back. To correct that loss of synchronization, the CPU 26 at 618 provides instructions to the audio decoder 25 to skip an audio frame. Skipping the audio frame while permitting the video frames to proceed through their natural progression permits the audio frames to slide forward in time and regain their synchronization with the video frames.

**[0057]** Referring to Fig. 8, except for its initiation, the video frame output process is similar to the audio frame output process of Fig. 7. At 700, the CPU 26 services an interrupt created from the raster scanning process which controls the playback of the video frames. After servicing the interrupt at 700, the CPU 26 then at 702 initializes various internal registers for video playback. Next, at 704, the CPU 26 decrements all of the frame counters, for example, frame counters 336, 364, etc.; but the CPU does not decrement the video frame counters having an FF value. Then at 708, the CPU determines whether any of those frame counters have a zero value. If a zero counter value is found, for example, at location of 336, then at 710, the CPU retrieves that video PTS value.

**[0058]** If at 712 of Fig. 8, the CPU 26 determines that the video is the master, the CPU creates at 714 an extension or offset for the system time counter equal to the difference between the current value of the system time counter and the video PTS value associated with the zero counter value, that is, for example, the PTS value in table location 338. If at 712, the CPU determines that the video is not the master, then at 716, the CPU determines whether the video PTS value associated with the PTS table counter having a zero value is within a certain range of the current value of the system counter. At 716, the CPU determines whether the video PTS value from the PTS table location 338 is greater than the current value of the system time counter plus its extension and plus a limit factor. In the case of video, the limit factor is chosen to be approximately equal to one-half the duration of the shortest video frame. If the comparison at step 716 is true, that means that the video frames are being played back faster or ahead of when the system is expecting them to be played back. To correct that loss of synchronization, the CPU 26 at 718 provides instructions to the video decoder 23 to repeat a video frame. Repeating the video frame while permitting the audio frames to proceed through their natural progression permits the video frames to slide back in time and regain their synchronization with the audio frames.

**[0059]** If the comparison at 716 is false, the CPU 26 then at 720 determines whether the PTS value from the PTS table location 338 is less than the current value of the system time counter plus its extension and minus the limit factor. If so, that means that the video frames are being played back slower or behind of when the system time counter is expecting them to be played back. To correct that loss of synchronization, the CPU 26 at 722 provides instructions to the video decoder 23 to skip a video frame. Skipping the video frame while permitting the audio frames to proceed through their natural progression permits the video frames to slide forward in time and regain their synchronization with the audio frames.

**[0060]** Thus, the audio and video output processes operate in parallel continuously and independently to provide synchronized audio and video presentations to the user. During that process, the PTS of the video frame being presented is compared to the PTS of the currently presented audio frame; and if any loss of synchronization is detected, a video frame is repeated or skipped to regain synchronization.

**[0061]** The system described above has a significant advantage over the prior system previously described herein. With the prior system, delays in servicing the audio PTS interrupt in combination with audio data packets that could be processed very quickly had the potential of selecting the wrong audio PTS value from the audio PTS table. In such a case, a wrong audio PTS value would be associated with the audio data being read from

the audio data FIFO. With the prior system, the counters in the audio PTS table 302 operate the same as the video counters described with respect to Fig. 6 herein. Thus, the audio PTS table counter locations 309 are, during the audio decoding process loaded with a number of audio frames corresponding to the audio decoder time. Therefore, in the prior system if the wrong audio PTS value were chosen from the PTS table, after the decoding delay, that erroneous choice would cause an erroneous frame counter value to be stored in table 302. Further, that erroneous PTS value would then be used in an attempt to synchronize the playback of the audio and video and might result in a perceptible loss of synchronization between the audio and video being presented to the user.

**[0062]** With the present system, the known number of audio frames provided in the header information of the audio data packet is used in generating the frame counters in the audio PTS table 302 along with an associated PTS value as part of the demultiplexing process. Further, during the decoding process with the output of each audio frame, the frame counter is decremented, and therefore, the number of audio frames being decoded and output with respect to each PTS value in the audio PTS table 302 is accurately tracked during the decoding process of each audio data packet. This is a far more accurate approach to associating a PTS value with decoded data being output, than the prior method of comparing memory pointers to identify a PTS value. Accordingly, with the present system, memory pointer comparisons are only used to check whether the audio PTS table counter values are approximately equal to the audio decoder delay to correct bit errors should any occur.

**[0063]** With the present system, by using the audio frame number from the header to lock the PTS values of the decoding process to the audio frame counter in the CPU, the coordination of the audio PTS values with demultiplexed audio data can be maintained very accurately throughout the playback process. The header portion of the video data packet does not contain similar information with respect to the number of video frames to be expected between PTS values. However, with the present system, since the audio frame presentation is very precise, adjusting the audio and video synchronization pursuant to the processes of Figs. 7 and 8 provides a highly synchronized audio and video presentation to the user that conforms very closely to the desired playback.

**[0064]** While the invention has been illustrated by the description of a preferred embodiment and while the embodiment has been described in considerable detail, there is no intention to restrict nor in any way limit the scope of the amended claims to such detail. Additional advantages and modifications will readily appear to those who are skilled in the art. For example, the header block of an audio data packet that has a PTS value also includes the number of bytes of audio data between successive audio PTS values, in other words, the number of bytes of audio data in the current data packet plus the number of bytes of audio data in successive audio data packets until the next data packet having an audio PTS value. This data can be stored in the write pointer location instead of storing the write pointer locations in the audio and video PTS tables 302, 324.

**[0065]** In Fig. 4, the frame counter values are created by adding the number of audio frames from the header block of the audio data packet to the value in the prior counter and the sum is written into the counter associated with the current PTS value. Further, all of the frame counter values are decremented by one with the output of each audio frame. Alternatively, the number of audio frames from the the header block of the audio data packet may be written into the frame counter; however in this case, only the currently active counter is decremented in response to the output of an audio frame. When that counter reaches zero, then the next counter is decremented.

**[0066]** As described, the audio/video synchronization is normally performed with respect to the system time counter in the system. The system time counter is a counter that, when operated in the playback of audio and video data, provides counter states that are directly related to PTS values. The synchronization may be performed using any other counter or clock that has respective counter or clock states that are correlated to the PTS values. Therefore, the invention in its broadest aspects is not limited to the specific details shown and described. Consequently, departures may be made from the details described herein without departing from the scope of the claims which follow.

## Claims

1. A method for associating an audio presentation time stamp ("PTS") value with an output frame of audio being a part of a sequence of frames of audio derived by demultiplexing and decoding audio input data in respective audio data packets, the output frames of audio being played back with output frames of video being a part of a sequence of frames of video are derived by multiplexing and decoding video data in respective video data packets, selected ones of the audio and video data packets include respective audio and video PTS values representing desired playback times of the respective audio and video data associated therewith, the selected ones of the audio data packets further including audio frame numbers representing a number of output frames of audio to be played back between the selected ones of the audio data packets, the method comprising the steps of:

   storing the audio and video PTS values contained in the selected ones of the respective au-

dio and video data packets during respective audio and video demultiplexing processes;
storing audio frame numbers in respective audio frame counters during the audio demultiplexing process, each of the audio frame counters being associated with one of the stored audio PTS values;
sequentially decoding the audio and video data in the selected ones of the respective audio and video data packets to produce the frames of audio and video, respectively;
providing a simultaneous playback of the frames of audio and video to the user;
selectively decrementing the audio frame counters in response to presenting each of the frames of audio;
detecting one of the audio frame counters having a zero value; and if so,
retrieving the audio PTS value corresponding to the one of the audio frame counters; and
selectively modifying the playback of the frames of audio and video to synchronize the presentation of the audio and video to the user.

**2.** The method of claim 1 further comprising after the step of retrieving the audio PTS value, the steps of:

providing a audio clock extension for a system time counter approximately equal to a difference between an audio PTS value associated with the one of the audio frame counters and a current value of the system time counter; and
adjusting a current state of the system time counter by the audio clock extension, thereby bringing the system time counter in synchronization with the playback of the frames of audio.

**3.** The method of claim 2 further comprising the steps of:

storing at the start of a video decoding process for the selected ones of the video data packets, a number of video frames in respective video frame counters, the number of video frames representing a time duration approximately equal to a duration of the video decoding process;
decrementing all of the video frame counters in response to presenting each of the frames of video;
detecting one of the video frame counters having a zero value; and if so,
retrieving the video PTS value corresponding to the one of the video frame counters; and
determining a video PTS value associated with the one of the video frame counters to be approximately equal to the current state of the system time counter plus the audio clock extension, thereby determining that the frames of audio and video are in synchronization.

**4.** The method of claim 3 further comprising the steps of:

determining in response to the one of the video frame counters having a zero value that the frames of video are currently being presented to the user too fast and out of synchronization with the frames of audio currently being presented to the user; and
repeating a frame of video to bring the frames of video into closer synchronization with the presentation of the frames of audio.

**5.** The method of claim 4 further comprising the step of determining a video PTS value associated with the one of the video frame counters to be greater than the current state of the system time counter plus the audio clock extension, thereby indicating that the frames of video are being presented too fast with respect to the presentation of the frames of audio.

**6.** The method of claim 5 further comprising the steps of:

determining in response to the one of the video frame counters having a zero value that the frames of video are currently being presented to the user too slowly and out of synchronization with the frames of audio currently being presented to the user; and
skipping a frame of video to bring the frames of video into closer synchronization with the presentation of the frames of audio.

**7.** The method of claim 6 further comprising the step of determining a video PTS value associated with the one of the video frame counters to be less than the current state of the system time counter plus the audio clock extension, thereby indicating that the frames of video are being presented too slowly with respect to the presentation of the frames of audio.

**8.** The method of claim 7 further comprising the step of determining a video PTS value associated with the one of the video frame counters to be less than the current state of the system time counter plus the audio clock extension minus a limit factor, the limit factor being determined as a function of the delays in decoding the audio data.

**9.** The method of claim 8 further comprising the step of detecting the selection of an audio master synchronization determining a synchronization of the playback of frames of video to the playback of

frames of audio.

**10.** The method of claim 1 further comprising the steps of:

storing at the start of a video decoding process for the selected ones of the video data packets, a number of video frames in respective video frame counters, the number of video frames representing a time duration approximately equal to a duration of the video decoding process;
decrementing all of the video frame counters in response to presenting each of the frames of video;
detecting one of the video frame counters having a zero value; and if so,
retrieving the video PTS value corresponding to the one of the video frame counters;
providing a video clock extension for the system time counter approximately equal to a difference between a video PTS value associated with the one of the video frame counters and a current value of the system time counter; and
adjusting a current state of the system time counter by the video clock extension, thereby bringing the system time counter in synchronization with the playback of the frames of video.

**11.** The method of claim 10 further comprising the steps of:

determining in response to the one of the audio frame counters having a zero value that the frames of audio are currently being presented to the user too fast and out of synchronization with the frames of video currently being presented to the user; and
repeating a frame of audio to bring the frames of audio into closer synchronization with the presentation of the frames of video.

**12.** The method of claim 11 further comprising the step of determining an audio PTS value associated with the one of the audio frame counters to be greater than the current state of the system time counter plus the video clock extension, thereby indicating that the frames of audio are being presented too fast with respect to the presentation of the frames of video.

**13.** The method of claim 12 further comprising the step of determining an audio PTS value associated with the one of the audio frame counters to be greater than the current state of the system time counter plus the video clock extension plus a limit factor, the limit factor being determined as a function of the video frame length.

**14.** The method of claim 13 further comprising the steps of:

determining in response to the one of the audio frame counters having a zero value that the frames of audio are currently being presented to the user too slowly and out of synchronization with the frames of video currently being presented to the user; and
skipping a frame of audio to bring the frames of audio into closer synchronization with the presentation of the frames of video.

**15.** The method of claim 14 further comprising the step of determining an audio PTS value associated with the one of the audio frame counters to be less than the current state of the system time counter plus the video clock extension, thereby indicating that the frames of audio are being presented too slowly with respect to the presentation of the frames of video.

**16.** The method of claim 15 further comprising the step of determining an audio PTS value associated with the one of the audio frame counters to be less than the current state of the system time counter plus the video clock extension minus a limit factor, the limit factor being determined as a function of the video frame length.

**17.** The method of claim 16 wherein the limit factor is approximately equal to approximately one-half of a duration of a shortest video frame.

**18.** The method of claim 17 further comprising the step of detecting the selection of a video master synchronization determining a synchronization of the playback of frames of audio to the playback of frames of video.

**19.** The method of claim 11 further comprising the step of determining an audio PTS value associated with the one of the audio frame counters to be greater than the current state of the system time counter, thereby indicating that the frames of audio are being presented too fast with respect to the presentation of the frames of video.

**20.** The method of claim 19 further comprising the step of determining an audio PTS value associated with the one of the audio frame counters to be greater than the current state of the system time counter plus a limit factor, the limit factor being determined as a function of the video frame length.

**21.** The method of claim 20 further comprising the steps of:

determining in response to the one of the audio

frame counters having a zero value that the frames of audio are currently being presented to the user too slowly and out of synchronization with the frames of video currently being presented to the user; and
skipping a frame of audio to bring the frames of audio into closer synchronization with the presentation of the frames of video.

**22.** The method of claim 21 further comprising the step of determining an audio PTS value associated with the one of the audio frame counters to be less than the current state of the system time counter, thereby indicating that the frames of audio are being presented too slowly with respect to the presentation of the frames of video.

**23.** The method of claim 22 further comprising the step of determining an audio PTS value associated with the one of the audio frame counters to be less than the current state of the system time counter minus a limit factor, the limit factor being determined as a function of the video frame length.

**24.** The method of claim 23 wherein the limit factor is approximately equal to approximately one-half of a duration of a shortest video frame.

**25.** The method of claim 24 further comprising the steps of:

determining in response to the one of the video frame counters having a zero value that the frames of video are currently being presented to the user too fast and out of synchronization with the frames of audio currently being presented to the user; and
repeating a frame of video to bring the frames of video into closer synchronization with the presentation of the frames of audio.

**26.** The method of claim 25 further comprising the step of determining a video PTS value associated with the one of the video frame counters to be greater than the current state of the system time counter, thereby indicating that the frames of video are being presented too fast with respect to the presentation of the frames of audio.

**27.** The method of claim 26 further comprising the step of determining a video PTS value associated with the one of the video frame counters to be greater than the current state of the system time counter plus a limit factor, the limit factor being determined as a function of the delays in decoding the audio data.

**28.** The method of claim 27 further comprising the steps of:

determining in response to the one of the video frame counters having a zero value that the frames of video are currently being presented to the user too slowly and out of synchronization with the frames of audio currently being presented to the user; and
skipping a frame of video to bring the frames of video into closer synchronization with the presentation of the frames of audio.

**29.** The method of claim 28 further comprising the step of determining a video PTS value associated with the one of the video frame counters to be less than the current state of the system time counter, thereby indicating that the frames of video are being presented too slowly with respect to the presentation of the frames of audio.

**30.** The method of claim 29 further comprising the step of determining a video PTS value associated with the one of the video frame counters to be less than the current state of the system time counter minus a limit factor, the limit factor being determined as a function of the delays in decoding the audio data.

**31.** The method of claim 32 further comprising the step of detecting the selection of a no master synchronization for which no clock extension is determined or used and both the video and audio are independently synchronized to the system time counter.

**32.** A method for synchronizing a play back of frames of audio and video output data, the frames of audio and video output data being derived from demultiplexing and decoding audio and video data contained in respective audio and video data packets, selected ones of the audio and video data packets containing presentation time stamp PTS values, and the selected ones of the audio data packets containing audio frame numbers, each of the audio frame numbers representing a number of frames of audio to be played back between the selected ones of the audio data packets, the method comprising:

sequentially storing during an audio demultiplexing process of the audio data packets containing PTS values, audio data in respective audio FIFO memory locations;
sequentially storing PTS values in first memory locations in an audio PTS memory table during the first demultiplexing process;
storing in second memory locations in the audio PTS table during the first demultiplexing process, write pointer locations associated with the data written into the video FIFO memory locations for the selected video data packets con-

taining a PTS value;
storing audio frame numbers in counter memory locations in the PTS table during the first demultiplexing process;
initiating an audio decoding process simultaneously with the a start audio frame interrupt to a CPU;
acquiring a read pointer location of the audio FIFO in response to the start audio frame interrupt;
finding a write pointer location in the audio PTS table approximately equal to the read pointer location;
decoding the audio data being read from the audio FIFO;
presenting a successive audio output frame to the user;
decrementing all of the counter memory locations in the audio PTS table by one;
detecting any of the counter locations having a zero value; and if so.
adjusting a current state of a system time counter to the PTS value in the audio PTS table associated with the counter having a zero value.

**33.** A digital video processor for synchronizing a play back of output frames of audio and video data derived from demultiplexing and decoding audio and video data contained in audio and video data packets and selected ones of the audio and video data packets containing a presentation time stamp value, the video processor comprising:

audio and video FIFO memories for sequentially storing the audio and video data contained the respective audio and video data packets;
an audio PTS memory table having

first memory locations for sequentially storing the PTS values in the selected ones of the audio data packets,
second memory locations for storing values representing write pointer locations associated with the data written into the audio FIFO memory location in the selected audio data packets containing a PTS value, and
third memory locations functioning as counter locations for storing audio frame numbers, each representing a number of frames of audio to be played back until an occurrence of a subsequent PTS value; and

a video PTS memory table having

first memory locations for sequentially storing the PTS values in the selected ones of the video data packets,
second memory locations for storing values representing write pointer locations associated with the data written into the video FIFO memory locations for the selected video data packets containing a PTS value, and
third memory locations functioning as counter locations for storing a value representing a number of frames of video approximately equal to a delay time required for decoding a frame of video data prior to its play back to a user.

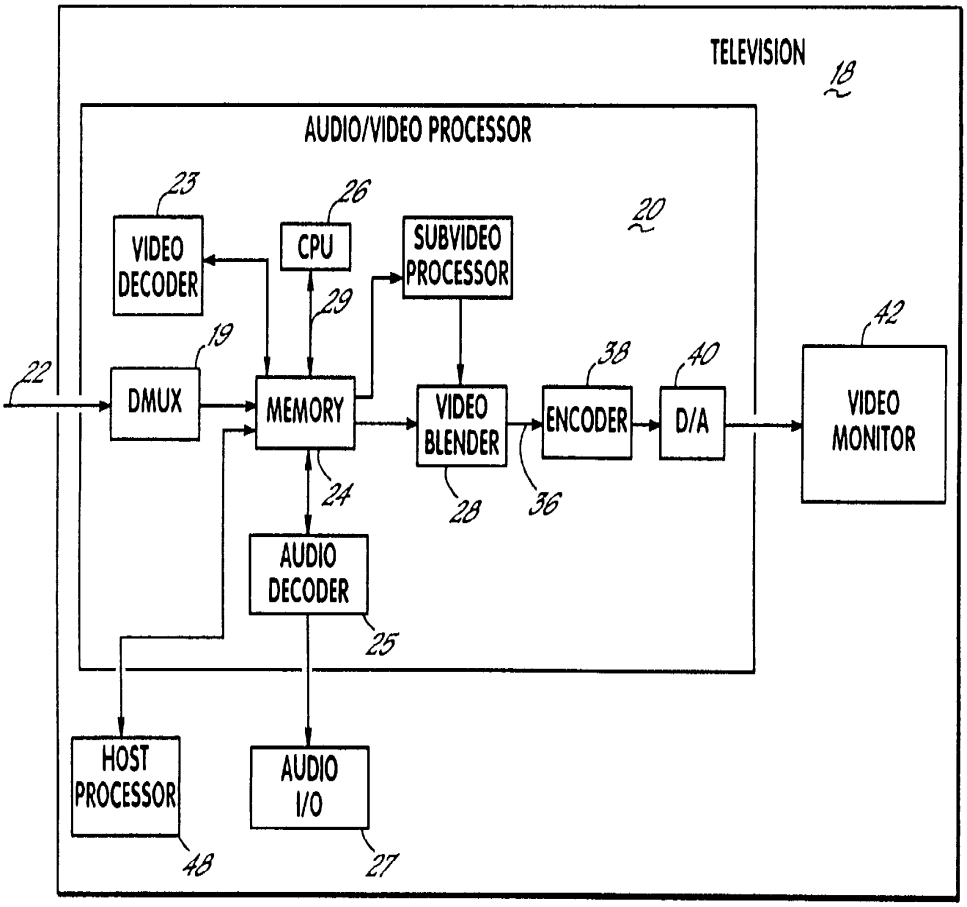

TELEVISION
18
AUDIO/VIDEO PROCESSOR
20
23
VIDEO DECODER
26
CPU
29
SUBVIDEO PROCESSOR
22
19
DMUX
MEMORY
24
VIDEO BLENDER
28
38
ENCODER
36
40
D/A
42
VIDEO MONITOR
AUDIO DECODER
25
HOST PROCESSOR
48
AUDIO I/O
27

FIG. 1

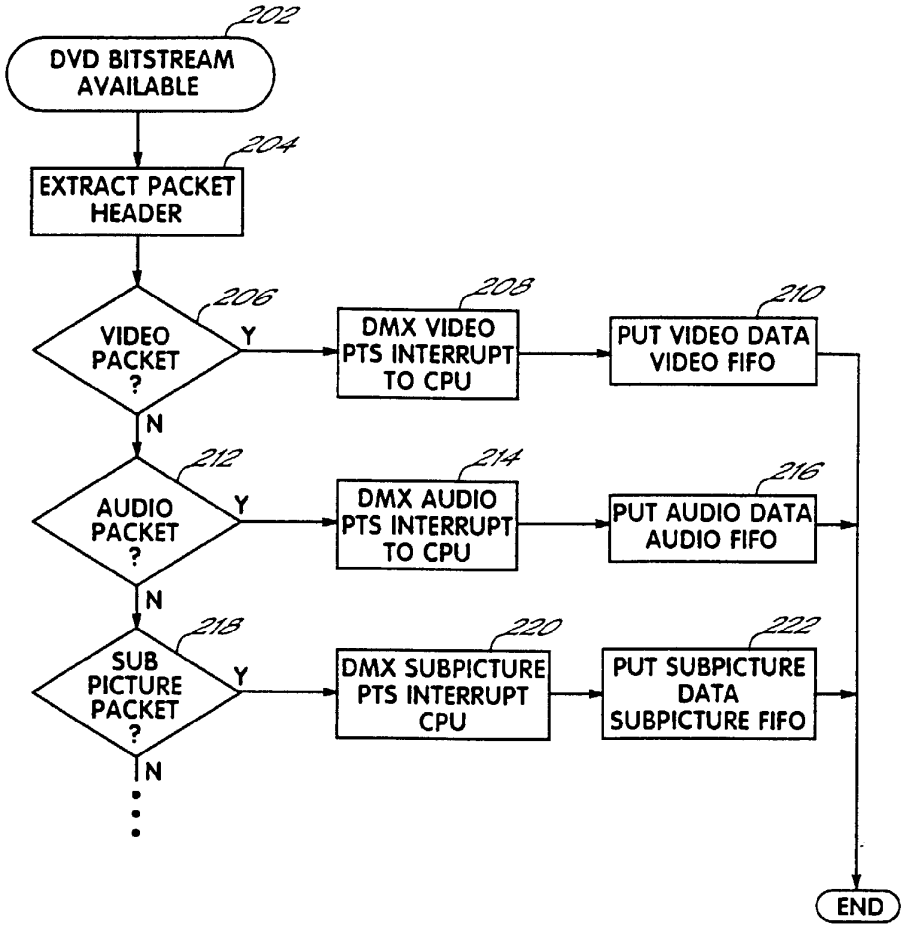

202
DVD BITSTREAM AVAILABLE
204
EXTRACT PACKET HEADER
206
VIDEO PACKET ?
Y
N
208
DMX VIDEO PTS INTERRUPT TO CPU
210
PUT VIDEO DATA VIDEO FIFO
212
AUDIO PACKET ?
Y
N
214
DMX AUDIO PTS INTERRUPT TO CPU
216
PUT AUDIO DATA AUDIO FIFO
218
SUB PICTURE PACKET ?
Y
N
220
DMX SUBPICTURE PTS INTERRUPT CPU
222
PUT SUBPICTURE DATA SUBPICTURE FIFO
END

FIG. 2

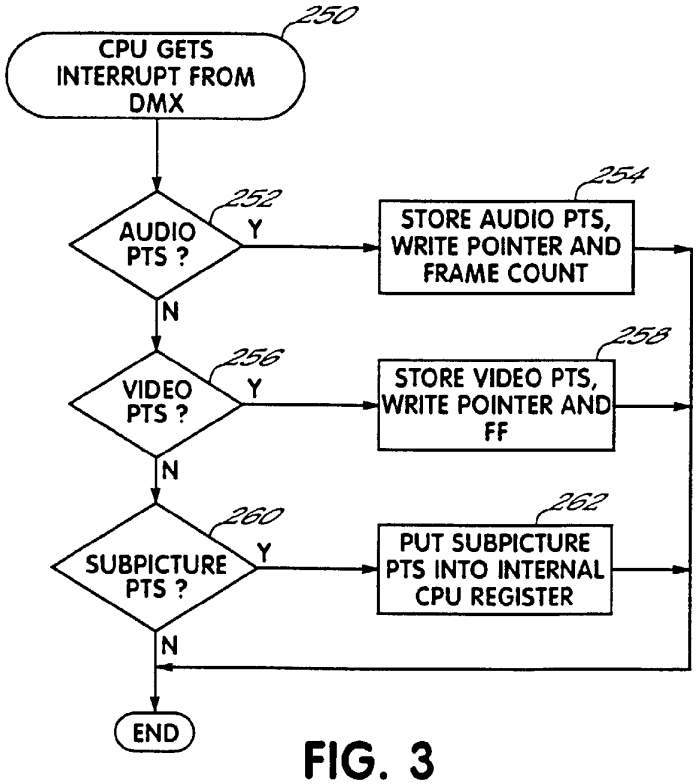

250
CPU GETS INTERRUPT FROM DMX
252
AUDIO PTS ?
Y
254
STORE AUDIO PTS, WRITE POINTER AND FRAME COUNT
N
256
VIDEO PTS ?
Y
258
STORE VIDEO PTS, WRITE POINTER AND FF
N
260
SUBPICTURE PTS ?
Y
262
PUT SUBPICTURE PTS INTO INTERNAL CPU REGISTER
N
END

FIG. 3

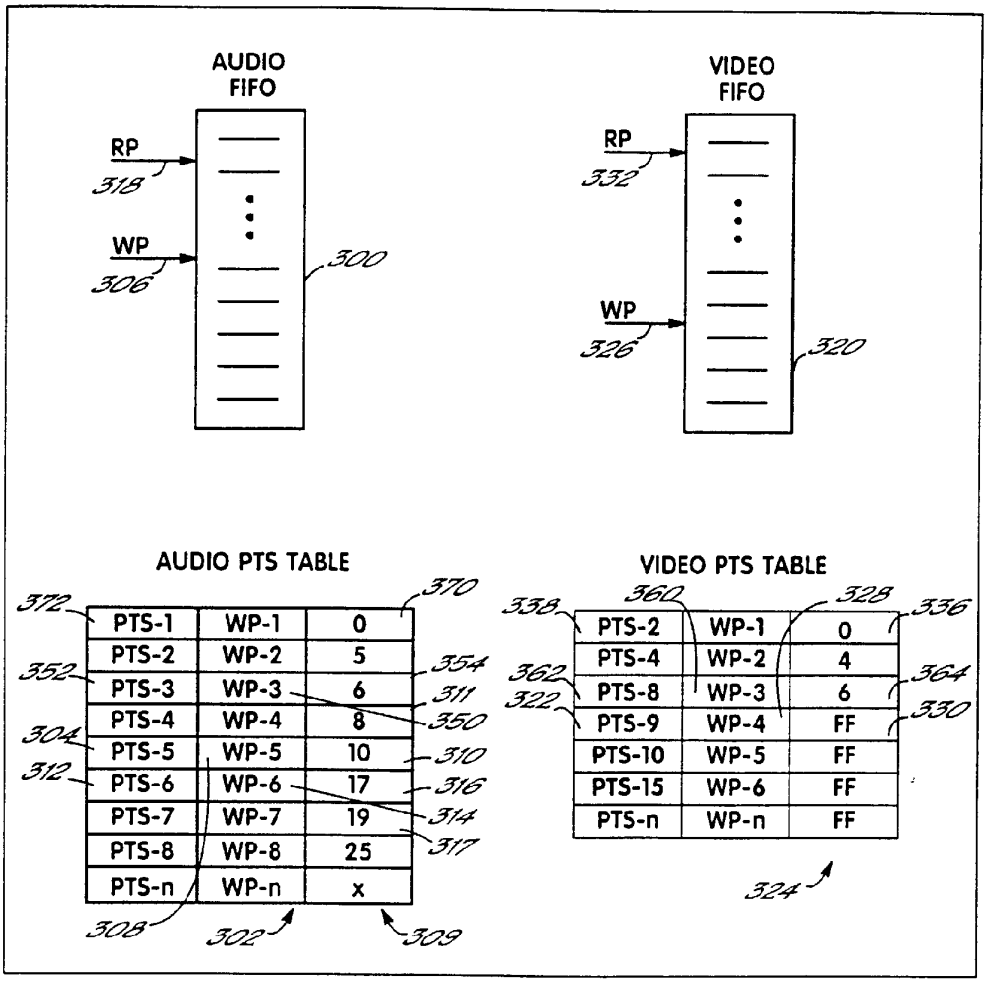

AUDIO FIFO
RP
318
WP
306
300
VIDEO FIFO
RP
332
WP
326
320
AUDIO PTS TABLE
372
370
PTS-1 WP-1 0
PTS-2 WP-2 5
352
354
PTS-3 WP-3 6
311
PTS-4 WP-4 8
350
304
PTS-5 WP-5 10
310
312
PTS-6 WP-6 17
316
PTS-7 WP-7 19
314
PTS-8 WP-8 25
317
PTS-n WP-n x
308
302
309
VIDEO PTS TABLE
358
360
328
336
PTS-2 WP-1 0
PTS-4 WP-2 4
362
364
PTS-8 WP-3 6
322
330
PTS-9 WP-4 FF
PTS-10 WP-5 FF
PTS-15 WP-6 FF
PTS-n WP-n FF
324

FIG. 4

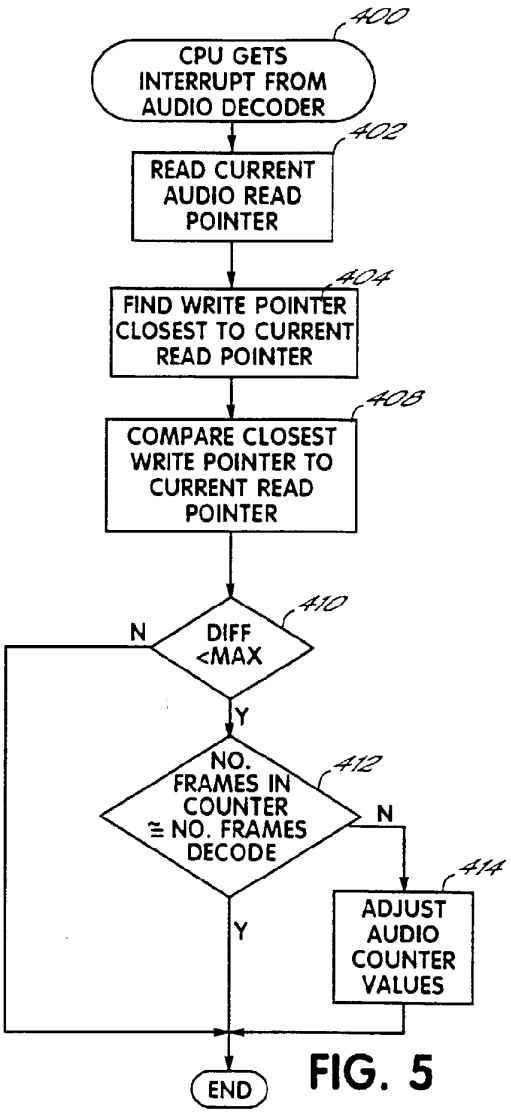

400
CPU GETS INTERRUPT FROM AUDIO DECODER
402
READ CURRENT AUDIO READ POINTER
404
FIND WRITE POINTER CLOSEST TO CURRENT READ POINTER
408
COMPARE CLOSEST WRITE POINTER TO CURRENT READ POINTER
410
DIFF <MAX
N
Y
412
NO. FRAMES IN COUNTER ≅ NO. FRAMES DECODE
N
Y
414
ADJUST AUDIO COUNTER VALUES
END

FIG. 5

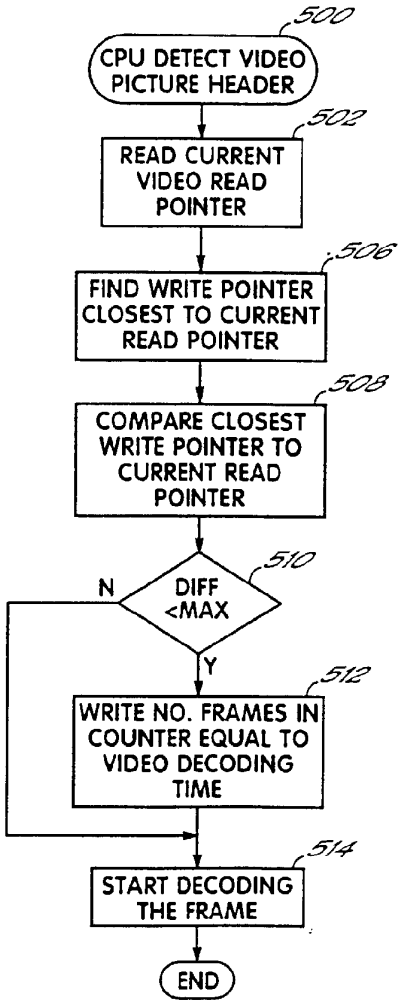

500
CPU DETECT VIDEO PICTURE HEADER
502
READ CURRENT VIDEO READ POINTER
506
FIND WRITE POINTER CLOSEST TO CURRENT READ POINTER
508
COMPARE CLOSEST WRITE POINTER TO CURRENT READ POINTER
510
DIFF <MAX
N
Y
512
WRITE NO. FRAMES IN COUNTER EQUAL TO VIDEO DECODING TIME
514
START DECODING THE FRAME
END

FIG. 6

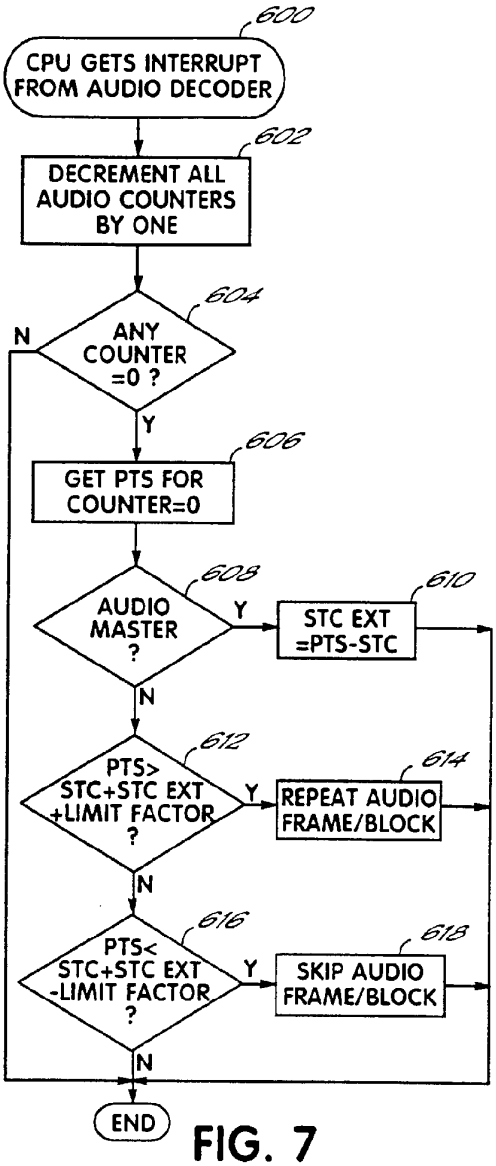

600
CPU GETS INTERRUPT FROM AUDIO DECODER
602
DECREMENT ALL AUDIO COUNTERS BY ONE
604
ANY COUNTER =0 ?
N
Y
606
GET PTS FOR COUNTER=0
608
AUDIO MASTER ?
Y
610
STC EXT =PTS-STC
N
612
PTS> STC+STC EXT +LIMIT FACTOR ?
Y
614
REPEAT AUDIO FRAME/BLOCK
N
616
PTS< STC+STC EXT -LIMIT FACTOR ?
Y
618
SKIP AUDIO FRAME/BLOCK
N
END

FIG. 7

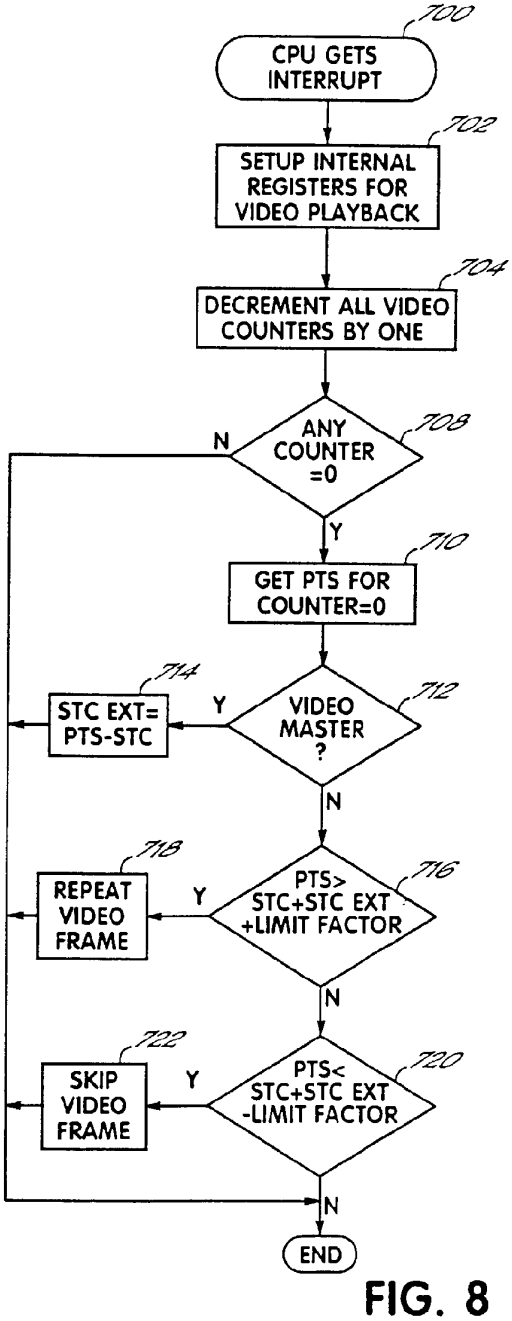

700
CPU GETS INTERRUPT
702
SETUP INTERNAL REGISTERS FOR VIDEO PLAYBACK
704
DECREMENT ALL VIDEO COUNTERS BY ONE
708
ANY COUNTER =0
N
Y
710
GET PTS FOR COUNTER=0
712
VIDEO MASTER ?
Y
714
STC EXT= PTS-STC
N
716
PTS> STC+STC EXT +LIMIT FACTOR
Y
718
REPEAT VIDEO FRAME
N
720
PTS< STC+STC EXT -LIMIT FACTOR
Y
722
SKIP VIDEO FRAME
N
END

FIG. 8

# Electronic Acknowledgement Receipt

| | |
|---|---|
| **EFS ID:** | 24888372 |
| **Application Number:** | 13864248 |
| **International Application Number:** | |
| **Confirmation Number:** | 5095 |
| **Title of Invention:** | SYSTEM AND METHOD FOR SYNCHRONIZING OPERATIONS AMONG A PLURALITY OF INDEPENDENTLY CLOCKED DIGITAL DATA PROCESSING DEVICES |
| **First Named Inventor/Applicant Name:** | Nicholas A. J. Millington |
| **Customer Number:** | 107361 |
| **Filer:** | Benjamin Michael Urban |
| **Filer Authorized By:** | |
| **Attorney Docket Number:** | 13-0401 (MBHB 15-517-CON) |
| **Receipt Date:** | 11-FEB-2016 |
| **Filing Date:** | 17-APR-2013 |
| **Time Stamp:** | 18:40:26 |
| **Application Type:** | Utility under 35 USC 111(a) |

## Payment information:

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| Submitted with Payment | no |

## File Listing:

| Document Number | Document Description | File Name | File Size(Bytes)/ Message Digest | Multi Part /.zip | Pages (if appl.) |
|---|---|---|---|---|---|
| 1 | Information Disclosure Statement (IDS) Form (SB08) | 13-0401_MBHB15-517-CON_IDS_Feb2016.pdf | 1055439<br>4b409421c08b226f265941ed74af8161333f983e | no | 7 |
| **Warnings:** | | | | | |
| **Information:** | | | | | |

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| 2 | Foreign Reference | EP0895427A2.pdf | 1317370<br>9d64634828f09470c11e866285a88b57b4466126 | no | 20 |
| **Warnings:** | | | | | |
| **Information:** | | | | | |
| 3 | Non Patent Literature | 13848921_AA_02-02-2016.pdf | 345491<br>c960c063c131d2874c5edfb7a394722c330dd8c4 | no | 8 |
| **Warnings:** | | | | | |
| **Information:** | | | | | |
| 4 | Non Patent Literature | 13864247_AA_02-01-2016.pdf | 310173<br>a08773d30b80582719051c41d8cec943960ff7e5 | no | 6 |
| **Warnings:** | | | | | |
| **Information:** | | | | | |
| 5 | Non Patent Literature | 13533105_Final_OA_11-18-15.pdf | 2050407<br>3a725f3cca80e3628df2d193b84b125e1f4c8cfd | no | 56 |
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| **Information:** | | | | | |
| 6 | Non Patent Literature | 13871795_Final_OA_11-30-15.pdf | 843634<br>27ea94cfdb19d9f83ccdb0a0ada6f93666c36c64 | no | 26 |
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| **Information:** | | | | | |
| 7 | Non Patent Literature | 14184528_Non-Final_OA_1-13-16.pdf | 485519<br>765023d1ccd525051d48c39189297f272dd05b00 | no | 14 |
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| **Information:** | | | | | |
| 8 | Non Patent Literature | 14290493_Non-Final_OA_12-28-15.pdf | 1024094<br>eb4ee16564db54fbc046df4f5251a60bf52d3e31 | no | 29 |
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| **Information:** | | | | | |
| 9 | Non Patent Literature | 14565544_NOA_1-11-16.pdf | 362337<br>db9bf5441d637e455607af418099e01833f0a8e8 | no | 5 |
| **Warnings:** | | | | | |
| **Information:** | | | | | |
| | | **Total Files Size (in bytes):** | 7794464 | | |

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**If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.**

**National Stage of an International Application under 35 U.S.C. 371**
**If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.**

**New International Application Filed with the USPTO as a Receiving Office**
**If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.**

Doc code: IDS
Doc description: Information Disclosure Statement (IDS) Filed

PTO/SB/08a (03-15)
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|---|---|---|
| | Application Number | 13864248 |
| | Filing Date | 2013-04-17 |
| | First Named Inventor | NICHOLAS; A. J. Millington |
| | Art Unit | 2442 |
| | Examiner Name | SURVILLO, OLEG |
| | Attorney Docket Number | 13-0401 |

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| | Attorney Docket Number | 13-0401 |

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| | Examiner Name | SURVILLO, OLEG |
| | Attorney Docket Number | 13-0401 |

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Please see 37 CFR 1.97 and 1.98 to make the appropriate selection(s):

That each item of information contained in the information disclosure statement was first cited in any communication from a foreign patent office in a counterpart foreign application not more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(1).

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See attached certification statement.

The fee set forth in 37 CFR 1.17 (p) has been submitted herewith.

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**SIGNATURE**

A signature of the applicant or representative is required in accordance with CFR 1.33, 10.18. Please see CFR 1.4(d) for the form of the signature.

| Signature | /Benjamin M. Urban/ | Date (YYYY-MM-DD) | 2015-12-29 |
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| Name/Print | Benjamin M. Urban | Registration Number | 71,591 |

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| **EFS ID:** | 24475158 |
| **Application Number:** | 13864248 |
| **International Application Number:** | |
| **Confirmation Number:** | 5095 |
| **Title of Invention:** | SYSTEM AND METHOD FOR SYNCHRONIZING OPERATIONS AMONG A PLURALITY OF INDEPENDENTLY CLOCKED DIGITAL DATA PROCESSING DEVICES |
| **First Named Inventor/Applicant Name:** | Nicholas A. J. Millington |
| **Customer Number:** | 107361 |
| **Filer:** | Benjamin Michael Urban |
| **Filer Authorized By:** | |
| **Attorney Docket Number:** | 13-0401 (MBHB 15-517-CON) |
| **Receipt Date:** | 29-DEC-2015 |
| **Filing Date:** | 17-APR-2013 |
| **Time Stamp:** | 17:56:49 |
| **Application Type:** | Utility under 35 USC 111(a) |

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| Application Number | 13864248 |
| Filing Date | 2013-04-17 |
| First Named Inventor | NICHOLAS; A. J. Millington |
| Art Unit | 2442 |
| Examiner Name | SURVILLO, OLEG |
| Attorney Docket Number | 13-0401 (MBHB 15-517-CON) |

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| | Application Number | 13864248 |
| | Filing Date | 2013-04-17 |
| | First Named Inventor | NICHOLAS; A. J. Millington |
| | Art Unit | 2442 |
| | Examiner Name | SURVILLO, OLEG |
| | Attorney Docket Number | 13-0401 (MBHB 15-517-CON) |

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| | Attorney Docket Number | 13-0401 (MBHB 15-517-CON) |

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(54) **Method and apparatus for controlling the performance of a loudspeaker in a room**

(57) A method for controlling the performance of a loudspeaker in a room, by determining in a first acoustic environment suitable parameters defining a first complex transfer function based on a measurement of the resultant movement of a loudspeaker driver diaphragm and the associated force, arising from the sound field in the room, acting on it, and in a second acoustic environment the same or different parameters of a second complex transfer function by measuring the loudspeaker driver relating to the room. The ratio between the real parts of the first and second transfer functions is used to define the performance of a correcting filter, included in the signal chain to the loudspeaker driver.

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## Description

The invention relates to a method and apparatus for controlling the performance of a loudspeaker in a room.

The actual performance of a loudspeaker is known to be highly dependent on the acoustics of the actual listening room and the actual loudspeaker position within this room. In particular the performance of a loudspeaker will change very noticeably when it is in proximity to the boundaries of the room. This is caused by the loading of the room on the loudspeaker as a radiator, or in other words due to the changing radiation resistance. A change of listener position changes the perceived performance of the loudspeaker, in particular due to early reflections and standing waves. However some boundary effects are universal in the room, in particular in the bass frequency range, and hence the perception of this range is less influenced by the listener position.

Loudspeaker designers experience this fact by having to make a compromise when optimizing the timbre of the loudspeaker so that the perceived sound will be acceptable under a number of different conditions, i.e. different room acoustics, loudspeaker positions, and listening positions. Even though making this compromise, the designer cannot ensure that the customer will always experience the intended quality. Thus, the listener will experience a performance of the loudspeaker that depends on the acoustic properties of the actual listening room and the position chosen for both loudspeaker and listener. There is a risk that an expensive loudspeaker which performs very well in the shop, will turn out performing badly or at least disappointingly when placed in a different environment and/or in a different position.

In order to compensate for this problem it is known to fit a switch in the cross-over filter unit in the loudspeaker in order that the bass response may be modified to suit a particular placement of the loudspeaker. At best, this must be considered a poor compromise, and if at all possible, the precise adjustment will be dependent on a measurement of the room characteristics. Some automatic systems are based on measuring the transfer function from the input of the loudspeaker to an omnidirectional microphone, placed at the preferred listening position or a number of representative positions. An equalizing filter is then inserted so that the resulting transfer function approximates a target function, which e.g. can be flat in the frequency range of interest. A major problem of such systems is the sensitivity to changes in the position of the sound source as well as the receiver. If the position of the loudspeaker or the listener is changed after calculating the equalizing filter, the effects can be severe colouration, pre-echoes, etc. Another problem of such systems is the choice of a suitable target function, where a flat function may not be found to be optimal.

It has in the present invention been realized that since all the involved acoustic phenomena's are considered to be linear, what is actually compensated through the apparently sensible procedures discussed above is the superposition of several phenomena, such as standing waves/natural frequencies of the room, early reflections, reverberation and the reduction of angular space angle due to the boundary effect, and it is considered that this is the reason why the known procedures will only function for one listening position.

It is the purpose of the invention to provide a method and apparatus for controlling the performance of a loudspeaker in a room in order that it becomes independent of the placement of the loudspeaker. This is obtained in a method according to the invention which is particular in that in a first acoustic environment the movement, e.g. velocity, of the diaphragm of the loudspeaker driver and the force, arising from the sound field, acting on it are determined by measuring suitable parameters, defining thereby a first complex transfer function, that in a second acoustic environment a second complex transfer function is determined by measuring the same or different parameters of the loudspeaker driver, relating to the room, that the ratio between the real parts of the first and second transfer functions is used to define the performance of a correcting filter, that the filter is applied in the signal chain to the loudspeaker driver.

The invention is based on the realization that there is a strong link between the way the loudspeaker sounds, in particular in the bass range, and its radiation resistance as a function of frequency, being the real part of the radiation impedance. Implementing the invention for a loudspeaker has proved to significantly increase the certainty that the customer will always experience the quality intended by the loudspeaker designer. This is achieved by measuring the radiated power output, radiation resistance or any similar physical parameter, e.g. real part of the acoustic wave impedance near the diaphragm, when the loudspeaker is placed in the actual position and comparing this to a reference measurement. More precisely this is obtained in that the loudspeaker in a first step is put in a reference room environment where it performs to a standard to be determined, and during which a reference radiated power output (real, i.e. active) or reference radiation resistance of a driver as a function of frequency is measured, and in that in a second step the loudspeaker is put in its room of usage where its attendant radiated power output or radiation resistance is measured, the ratio between the said real (active) power outputs or radiation resistances respectively being used to define the transfer function of a correcting filter in order to obtain said standard of performance determined in said reference room environment, and that in a third step said correcting filter is introduced in the electrical signal path to the driver. In principle a multi-driver loudspeaker should have each driver subjected to such a measurement, however one or several may be selected as representative. At the time of measurement of one particular driver or a group of drivers, the other drivers may either be short-circuited, disconnected or connected to the

signal.

When the loudspeaker is placed in a position which is not identical to the reference position/room, the bass performance changes. However, the method according to the invention is able to detect a major part of this change in the acoustic environment of the loudspeaker and to correct accordingly. Switching on and off an apparatus working according to the principles of the invention can lead to dramatic changes of the bass performance of the loudspeaker depending on how different the actual position and room are from the reference conditions. If a loudspeaker is designed to operate away from the walls of a room, then when placing such a loudspeaker close to a corner of the listening room, the bass performance becomes boomy, coloured, and the sound pressure level increases. In such a situation the apparatus according to the principles of the invention corrects the timbre in such a way that the perceived timbre is almost the same as in the reference position. The effect of the apparatus in this situation has been described by listeners as quite startling. The bass performance then was not plagued by the rumble which is traditionally a characteristic of a corner position, and the bass performance becomes more even and neutral without becoming "thin". In a corner position this is perceived as a dramatic improvement of the bass performance.

An advantageous embodiment is particular in that the loudspeaker is permanently fitted with measurement means, the ratio between reference and use measurements being used to define the parameters of the correcting filter. This enables a measurement to be initiated by a user or in the event that some predefined conditions are met, e.g. power up of the apparatus. This measurement cycle could be performed using a dedicated measuring signal, e.g. obtained from a particular Compact Disc.

A further advantageous embodiment of the invention is particular in that the loudspeaker is permanently fitted with measurement means, and the complex transfer function, which corresponds to the situation during usage, is continuously measured during operation of the apparatus. The ratio between reference and usage measurements being used to define the parameters of the correcting filter. This means that the loudspeaker will be automatically and continuously adaptable to any new listening room environment, e.g. using the played music as the stimuli when measuring the complex transfer functions. In this case the transfer function in the usage situation is continuously measured, and e.g. a digital signal processor in the signal chain calculates and performs the filtering which provides a sound from the loudspeaker which is very similar to the sound in the reference position/room and which presumably was judged positively during the design of the loudspeaker.

A further advantageous embodiment is particular in that the listening room is divided into zones of e.g. 30 cm by 30 cm, each having a correction filter transfer function assigned to it, and that information on the particular zone is fed to the correcting filter in the electrical signal path to the loudspeaker. By this means it is possible to accomodate a number of typical placements of a loudspeaker and to obtain a large degree of the improvement according to the invention, without having to perform a measurement.

A simpler arrangement is obtained by instructing the user to activate switches according to a schematic showing various typical placements of a loudspeaker in a room. This functions in practice, provided the loudspeaker is of the same type as the loudspeaker used in the reference environent.

An apparatus according to the invention is particular in that it comprises a filter, the transfer function of which is controllable by electronic/numerical signals, said signals being obtained from a unit which determines the ratio between a stored reference radiation resistance or active power output (real) as a function of frequency and a measured radiation resistance or active power output (real) in the usage situation. This ratio basically defines the amplitude response of the correction filter, and various filter implementations, e.g. minimum phase can be obtained from this. However various operation might be performed to modify the ratio before implementation, e.g. smoothing, convolution, frequency limiting, correction limiting, logarithm, exponential, multiplication, addition etc. and combinations of these. For instance, defining the amplitude response of the correction filter as the square root of the ratio seems to be a reasonable choice.

The invention will be further described in the following with reference to the drawing, in which

Fig. 1 shows the electrical, mechanical and acoustical signal paths associated with a loudspeaker placed in a room,
Fig. 2 shows a loudspeaker with a driver and measuring transducers, and
Fig. 3 shows a schematic of how the correction filter can be inserted in the signal chain according to one embodiment of the invention.

By way of example Fig. 1 shows the signal path and transfer functions relating to a loudspeaker in a room. The electrical signal from the source is fed to a power amplifier A which drives the loudspeaker which is designated B and comprises the electrical and mechanical parts of the loudspeaker driver unit and the acoustic influence of the cabinet enclosure. The output from the loudspeaker is transformed by the transfer function C from the acceleration of the diaphragm to the sound pressure in front of the diaphragm which may be measured by a microphone D as one example of how to obtain the force, arising from the sound field, acting on the diaphragm. An accelerometer E for example may measure the diaphragm acceleration directly. At point 1 the source signal is provided, at point 2 the electrical input signal to the loudspeaker driver is available, point 3 refers to the acceleration of the diaphragm of the loudspeaker, and at point 4 the sound pressure at some pre-

determined and fixed point in front of the driver is available. After being converted by the microphone D an electrical signal representing the sound pressure is available at point 5, and correspondingly, an electrical signal representing the membrane acceleration is available at point 6.

Fig. 2 shows one embodiment of the invention where the loudspeaker B with one of a multitude of possible placements of a microphone D and an accelerometer E.

Fig. 3 shows how a measurement of the radiation resistance of the loudspeaker is used when calculating the filter F, which is switched into the signal path. The signal processing may occur through any means available to the skilled person, the result will be a linear predistortion of the signal to the power amplifier in order that the loudspeaker provides an excitation of the listening room so that the perceived sound is a good approximation to the quality determined during the design phase. The advantage of making the measurement continuous is that the system will automatically compensate e.g. for an influx of listeners or a changed placement of furniture or the loudspeaker placement itself, which disturbs the sound distribution in the room. Such a disturbance is now compensated so that the perceived sound is essentially unchanged.

## Claims

1. A method for controlling the performance of a loudspeaker in a room, **characterized in** that in a first acoustic environment the resultant movement of the loudspeaker driver diaphragm and the associated force, arising from the sound field in the room, acting on it are determined by measuring suitable parameters defining a first complex transfer function, that in a second acoustic environment a second complex transfer function is determined by measuring the same or different parameters of the loudspeaker driver relating to the room, that the ratio between the real parts of the first and second transfer functions is used to define the performance of a correcting filter, that the filter is applied in the signal chain to the loudspeaker driver.

2. A method for controlling the performance of a loudspeaker in a room, in particular in the low frequency range, according to claim 1, **characterized in** that the loudspeaker in a first step is put in a reference room environment where it performs to a standard to be determined, and during which a reference radiated power output (real, i.e. active), reference radiation resistance (acoustic or mechanical) of a driver or any similar physical parameter, e.g. real part of the acoustic wave impedance near the diaphragm of the driver, as a function of frequency is measured, and in that in a second step the loudspeaker is put in its room of use where a usage radiated power output (real, i.e. active), usage radiation resistance of the same driver or any similar physical parameter, e.g. real part of the acoustic wave impedance near the diaphragm of the same driver, is measured, the ratio between the real part of said power outputs (active), radiation resistances or any similar physical parameters, e.g. real parts of the acoustic wave impedances near the diaphragm of the driver, respectively being used to define the transfer function of a correcting filter in order to obtain said standard of performance determined in said reference room environment, and that in a third step said correcting filter is introduced in the electrical signal path to the driver.

3. A method according to claim 1 and 2 , **characterized in** that the loudspeaker is permanently fitted with measurement means, the ratio between reference and usage measurements being used to define the parameters of the correcting filter.

4. A method according to claim 1 and 2, **characterized in** that the loudspeaker is permanently fitted with measurement means and is continously measuring the second complex transfer function, the ratio between reference and usage measurements being used to define the parameters of the correcting filter.

5. A method according to claim 3, **characterized in** that the measurement means are activated by a user or in the event that some predefined conditions are met, e.g. power up of the apparatus.

6. A method according to claim 1 and 2, **characterized in** that the listening room is divided into zones of e.g. 30 cm by 30 cm, each having a correcting filter transfer function assigned to it, and that information on the particular zone is fed to the correcting filter in the electrical signal path to the loudspeaker.

7. An apparatus for performing the method according to claim 1 and 2, **characterized in** that it comprises a filter, the transfer function of which is controllable by electronic/numerical signals, said signals being obtained from a unit which determines the ratio between a stored reference radiation resistance or active power output (real) or wave resistance near the driver as a function of frequency and a measured radiation resistance or active power output (real) or wave resistance near the driver in the usage situation. This ratio basically defines the amplitude response of the correction filter, and various filter implementations, e.g. minimum phase can be obtained from this. However various operations might be performed to modify the ratio before implementation, e.g. smoothing, convolution, frequency limiting, correction limiting, logarithm, exponential, multiplication, addition etc. and combinations of these. For instance, defining the

amplitude response of the correction filter as the square root of the ratio seems to be a reasonable choice.

8. A method according to claim 3 or 4 or 5 or 6, **characterized in** that a multi-driver system, e.g. 2 woofers and 1 tweeter, should have each driver subjected to a measurement according to claim 1 and 2. However one or several may be selected as representative. At the time of measurement of one particular or a group of drivers, the other drivers may either be short-circuited, disconnected or connected to the signal. Each driver may have individual filters implemented or some groups may have a common filter implemented.

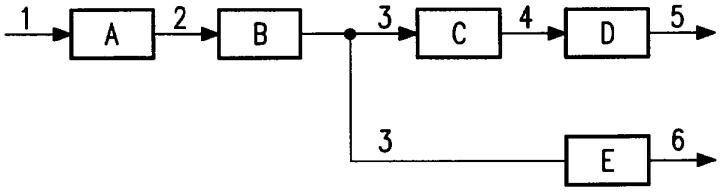



FIG. 1

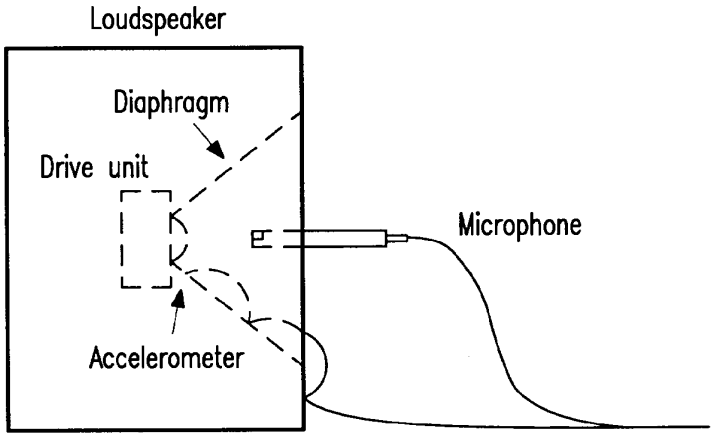



FIG. 2

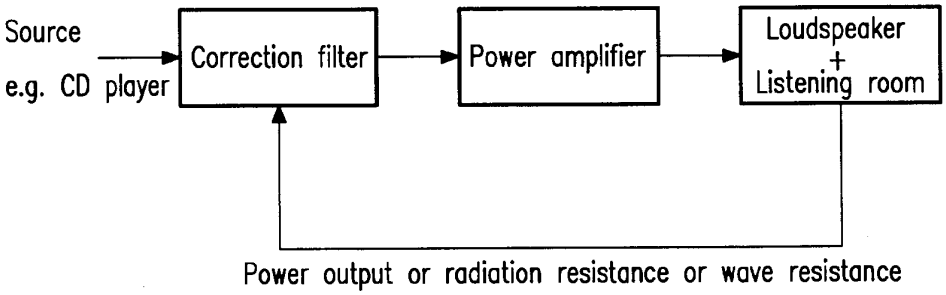



FIG. 3

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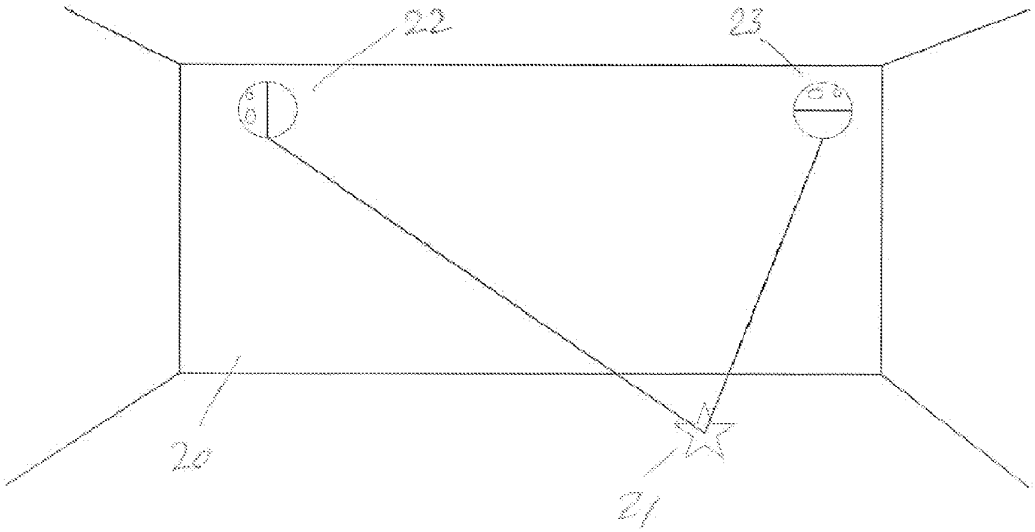
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A request for re-establishment of rights in respect of the twelve-month period from the date of filing of the first application has been granted (Art.87(1) and Art. 122 EPC).

## (54) A method and a system to adjust the acoustical performance of a loudspeaker

(57) The invention relates to a method and a system for optimizing the performance of a loudspeaker system as perceived by user.

The physical part of the speaker system is adjustable which enables the speaker units to be placed in positions that imply maximal acoustical performance. This is obtained by combined means to: 1) bring the speaker in a specified position and 2) apply accordingly position dependant individual acoustical filters inserted in the signal path to each individual speaker.

Figure 5




EP 2 043 381 A2

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## Description

### Field of the Invention

**[0001]** The present invention relates to improvements in sound experience as perceived by the user in a listening room. Specifically - but not exclusively the means to obtain the increased performance is by adjusting the speaker position according to the listening position of the user and accordingly adjust individual filter means in the signal path to the loudspeaker.

### Background of the Invention

**[0002]** When a loudspeaker is placed within an enclosed space the timbre of the loudspeaker as perceived by a listener is highly affected by the acoustical properties of the space.
Traditionally built-in loudspeaker in walls, ceiling's and floors has a very poor performance due to the difficult radiation properties out from the speaker units.

**[0003]** The designer of the sound reproduction system usually wishes to give the listener the same intended listening experience regardless of the acoustical properties of the listening space.

**[0004]** Attempts of providing systems which addresses this desire has been suggested in the art, see for example JP58218294, JP58170195 and JP57116495.
From JP58218294 is known a system where the mid and high range speaker units are arranged in a convex rotatable member relative to the loudspeakers surface. By rotating the member, the sound emitting angle due to the convex shape of the member from the mid and high range speakers, relative to the speaker's surface may be altered, in order to improve the overall sound emission.
In JP58170195 is disclosed a system where the loudspeaker type may be changed by rotating a member. The mid and high range loudspeaker units are mounted in the rotatable member. Furthermore by rotating the member a bus reflex port may be opened or closed in the front surface of the loudspeaker, thereby changing the properties of the loudspeaker.
Finally in JP57116495, the tweeter speaker unit of a loudspeaker construction, has been mounted such that it may tilt relative to a woofer speaker. In this manner it is possible to adjust the tweeters emission relative to the woofers emission, simply by directing the tweeters sound emission in a different direction.

**[0005]** With the current invention the loudspeaker system may adapt dynamically to the listeners position in a room.

**[0006]** Thus the object of the invention is to provide a loudspeaker system concept with dynamic properties such that not only the sound properties are optimised but also the listeners position is taken into account such that it is possible to create an optimum listening experience for the listener regardless of the listeners position in the room.

**[0007]** This object is achieved by a speaker system according to independent claim 1.

**[0008]** In further embodiments according to the dependent claims further advantageous objects are achieved, for example by:

- Including one or more speaker units,
- the speaker units are mounted into a frame that is rotate able and tilt able,
- individual filters may be adapted according to the individual speaker positions,
- positioning the speakers according to the listener position may be user commanded and/or automatically controlled, and
- active loudspeakers are applied for efficiency.

### Description of the Invention

**[0009]** In the following, preferred embodiments of the invention will be described with reference to the drawing wherein

| | |
|---|---|
| Fig. 1 | illustrates a top view of the invention with the speaker units in the default position. |
| Fig. 2 a & b | illustrates a top view of the invention with the speaker units in two different positions. |
| Fig. 2 c & d | illustrates a side view of the invention with the speaker units in two different positions. |
| Fig. 3 | illustrates the coordinate systems related to rotation- and tilt positions. |
| Fig. 4 | illustrates the signal path including filters, amplifiers and two speaker units. |
| Fig. 5 | illustrates how to set of speaker systems adjust according to the listing position in a room. |
| Fig. 6 | illustrates the control system of the invention. |

**[0010]** In a first aspect, the invention relates to:

**[0011]** A speaker system, where the speaker units mounted in the speaker system may be configured into different

positions to increase the acoustical performance perceived by the user, where said speaker system contains a mechanical structure consisting of four members:

- a first member(1), where said first member may have any geometrical shape, where said member has a first surface and defining a circular innermost periphery of said first member;
- a second member(2), where said second member may be arranged within the circular periphery provided on the first member(1), such that the second member may be rotate able around an axis perpendicular to, or close to being perpendicular to, the plane of the surface of the first member(1), and with the second member(2) fully or partly having a material surface;
- a third member(3) being an integrated part of the second member(2) or being a separate object mounted on top of the second member(2), and where said third member (3) includes one or more speaker units(5,6) mounted to deliver acoustical output directed away from the surface of the third member (3);
- a fourth member (4), where said fourth member is support structure including a hinge for the third member (3) and enables the third member(3) to be tilt able around an axis horizontal to, or close to being horizontal to, the plane of the surface of the second member(2) and with the fourth member (4) attached to the second member(2).

**[0012]** In a preferred embodiment the motorized means (31, 32, 33) control the position of the loudspeaker units (5, 6) in the speaker system. The motor means controls the rotating of the second member (2) and controls the tilting of the third member (3).

**[0013]** Standard means are applied to control the motors and to determine the position of each motor relative to a polar coordinate system for each of the movements, i.e. the rotation(8) of the second object(2) and the tilt(9) of the third object (3).

**[0014]** In one aspect the required position of the speakers are obtained by passing information of the X, Y coordinates related to the rotation of the second member to the second member motor means and by passing information of the X, Y coordinates related to the tilting of the third member to the third member motor means.

**[0015]** A predefined set of X, Y parameters for each of the motor means may be applied as the initial setting of the second- and third members upon start up of the speaker system. The same set of parameters may be applied as a default position that may be returned to during operation, thus to act as a Reset position for the loudspeakers.

**[0016]** In another aspect the rotation and the tilting of the loudspeaker units may be controlled by the user via a command from a wireless control device. Standard means (e.g. Infrared, Radio Frequency, Bluetooth or alike) may be applied for the communication from/to the remote terminal.
Specific X, Y coordinate values may be transferred to the speaker system and/or relative commands like: 'rotate left; rotate right; tilt up; tilt down; reset or similar commands.
Other functional related commands like 'bigger'; 'smaller'; 'light'; 'heavy' may be sent from a remote device for further mapping into specific X, Y parameter by the speaker system.

**[0017]** In the preferred embodiment this flexible addressing speaker units positions are that:

- the X, Y coordinates of the second member position may be forced to given values, and thus forced to a given position of the speaker, specified from an external control device, and
- the X, Y coordinates of the third member position may be forced to given values, and thus forced to a given position of the speaker, specified from an external control device.

**[0018]** In yet another aspect the position of the speaker units of one speaker system may automatically be oriented towards a detected location of a source signal in a room. This room location may be the listing position. Standard means are applied to generate the source signal; e.g. an infrared signal from a control device may be applied, and issued from the device upon a user command. The speaker system has a built in infrared receiver and detects the infrared beam. In a sequential flow of operation each of the motor means, i.e. the rotation motor means and the tilt motor means, are positioned from their respective min. to the max. positions in combinations to detect the maximum of the received IR signal. Alternatively to the IR signal and - detection method, an RF signal and - detection method or a sound signal and - detection method may be applied.

**[0019]** In the preferred embodiment these automated speaker units positions are where: the position of the second member and the position of the third member are determined from a detected maximum and or a detected minimum in a signal beam issued from a source located in the listening position of the user towards the speaker system.

**[0020]** In yet another aspect individual correction filters are applied in the signal path of every speaker according to the orientation/position of the speaker; this to maximize the sound quality as perceived by the listener. A predefined set of filter attributes are available for a set of defined X, Y positions related rotation and related to tilting of the loudspeaker units.

**[0021]** In the preferred embodiment these correction filter attributes may be used dynamically and consists of:

- a predefined set of filter attributes are applied as the default correction filters to be in the signal path for each of the one or more speakers, and
- a predefined plurality of individual set of filter attributes are related to different speaker positions for each of the one or more speakers, and
- a predefined set of filter attributes are selected and applied as the actual correction filter to be in the signal path for each of the one or more speakers, where the set of filter attributes are selected based on the X,Y position of the speaker.
- a predefined plurality of individual set of filter attributes related to speaker positions for each of the one or more speakers may be replaced with data from an external source.

**[0022]** In the preferred embodiment these correction filter attributes are related to the X, Y position of the rotation means and to the X, Y position of the tilt means in a simple index table in a discrete manner:

**[0023]** If X, Y position is in the interval pos1 -> pos2 Then apply filter set1

| Rotate position | Tilt position | Filter | Index |
|---|---|---|---|
| Rpos1 -> Rpos2 | Tpos1 -> Tpos2 | Fset1 | 1 |
| | Tpos2 -> Tpos3 | Fset2 | 2 |
| | +++ | +++ | // |
| | TposN-> TposM | FsetN | N |
| | | | |
| Rpos2 -> Rpos3 | Tpos1 -> Tpos2 | Fset1.1 | N+1 |
| | Tpos2 -> Tpos3 | Fset2.1 | N+2 |
| | +++ | +++ | // |
| | TposN-> TposM | FsetN.1 | N+N |
| | | | // |
| Rpos3 -> Rpos4 | Tpos1 -> Tpos2 | Fset1.2 | 2N+1 |
| | Tpos2 -> Tpos3 | Fset2.2 | 2N+2 |
| | +++ | +++ | // |
| | TposN-> TposM | FsetN.2 | // |
| +++ | | | |
| RposP -> RposQ | Tpos1 -> Tpos2 | Fset1.p | // |
| | Tpos2 -> Tpos3 | Fset2.p | // |
| | +++ | +++ | // |
| | TposN-> TposM | FsetN.p | // |
| | | | |

**[0024]** The table above illustrates the mapping of positions into filter index:

- a predefined plurality of individual set of X, Y coordinates are related to the second member position and where a predefined plurality of individual set of other X, Y coordinates are related to the third member position and where an index is related to a set of corresponding filter attributes that applies in that specific speaker position, and
- a predefined plurality of individual set of X, Y coordinates are related to the second member position and where a predefined plurality of individual set of other X, Y coordinates are related to the third member position and where an index is related to a set of corresponding filter attributes that applies in that specific speaker position and where the complete set of definitions may be replaced with data from an external source.

**[0025]** In figure 1 the invention is displayed with the main elements:

- The basic structure as a first element (1) may act as the fixture of other parts of the construction. The outer shape of this element is primarily determined by the requirement set up for the end user product, into which the invention will be a part of.
- A circular cavity in the first element is the room for the second (2) and the third (3) elements. Those elements are mounted so they have the freedom to rotate. According to requirements the allowed rotation may be whatever subset of the full rotation capability of 0 -> 360 deg. Preferable the axis of rotation is perpendicular to the surface of the first element(1).
- The third element (3) is attached to the rotational part of the construction (2) via a hinge (4) or alike, that allows the third member (3) to tilt. According to requirements the allowed tilting may be whatever subset of the full movement capability of 0 -> 90 deg. Preferable the axis of tilting is parallel to the surface of the second element (2).
- The loudspeaker units (5, 6) are mounted into the third element (3) such that the acoustical output is radiated away from the surface of the third element.
  One or more speaker units may be implemented according to product requirements. In a preferred embodiment two speakers are applied: one for high frequency sound radiation and one for medium frequency sound radiation.
- As part of the subsystem that detects a listening position (37) the detector of an infrared receiver (7) may be integrated into the surface of the third element. Alternative means may be implemented applying RF- or sound signal technologies.

**[0026]** Figure 2 illustrates different positions of the third element. The positions are examples of how the loudspeaker speaker units (5, 6) may be oriented towards a specific position in a listening room:

- In figure 2.a the second - and third element is rotated approximately - 45 deg. relative to the initial position in figure 1.
- In figure 2.b the second - and third element is rotated approximately - 90 deg. relative to the initial position in figure 1.
- In figure 2.c the second - and third element is rotated approximately - 90 deg. relative to the initial position in figure 1.
- In figure 2.d the second - and third element is rotated approximately - 90 deg., and the third element is tilted approximately - 45 deg. relative to the initial position in figure 1.

**[0027]** Figure 3 illustrates how ordinary X, Y coordinate systems defined the position of the speaker units (5, 6). A specific position may be defined by X, Y coordinates (8, 9) or an angle relative to the x-axis (8', 9'):

- Figure 3.a display an example of the rotation of the second - and third element into a position (8).
- Figure 3.b display an example of the tilting of the third element into a position (9).

**[0028]** Figure 4 illustrates how one of more speaker units is configured:

- Compensation filters (12, 12') are inserted into the signal path (11, 11'). The parameters determining the characteristics of a filter may be replaced dynamically according to an actual position of the speaker units. Individual filters are applied per speaker unit (14, 14').
- Individual amplifiers (13, 13') are applied per speaker unit (14, 14'). Active speakers may be applied. For efficiency reasons, i.e. to optimize physical size and power consumption versus output power performance, a technology like ICEpower from Bang & Olufsen may be used.

**[0029]** Typical applications of the speaker system as outlined may be into a stand alone loudspeaker or to be applied as an in-wall loudspeaker, or as an in-ceiling loudspeaker or as an in-floor loudspeaker, or as a loudspeaker in a home appliance and in media systems.

**[0030]** In figure 5 it is illustrated how two in-wall speaker systems (22, 23) are located in a room (20). One of the loudspeaker systems (22) is vertically aligned towards the listening position (21) and the other of the loudspeaker systems (23) is horizontally aligned towards the listening position (21).

**[0031]** In a room with a plurality of loudspeaker systems according to the invention, the filters to be applied dynamically per loud speaker unit in all systems may be configured according to different methods based on:

- Positions commanded externally from a user remote control device (36).
- A detected listener position, as deduced from an incoming source signal beam, e.g. an infrared signal (37).
- A detected position of other loudspeakers in the room, as deduced from an incoming sound signal received by the actual speaker system, e.g. a sound signal issued by another speaker unit in the room and received via a microphone (34') by the actual speaker system.

**[0032]** Figure 6 display the controller (30) of the loudspeaker system of one embodiment according to the invention:

- The sound signal (40, 11) is via the filters (12, 12') and the amplifiers connected to the loud speaker units (14, 14').
- The dynamic load and reload of the filter attributes is supported by data sourced in a table (39).
- The support of the filter management that is related to actual X, Y positions of the speaker units is supported by data sourced in a table (38).
- Archived filter attributes may be updated or modified by a reload af new data from an external source (35). The load may via a wired data link or via a wireless data link and sourced e.g. from a PC.
- A subsystem (37) supports the detection of the listening position by detecting the maximum of an incoming source signal e.g. infra red light beam. The system detects the maximum by analyzing different combinations of the rotation position and the tilt position.
- A subsystem (34) supports the detection of position of other loudspeakers in the room, as deduced from an incoming sound signal received via a microphone (34') by the actual speaker system.
- A subsystem (31) controls the motor that supports the rotational movement (33) and the tilt movement (33'). Standard means are applied for the control and the position of each of the motors, one to detect the X, Y position of the rotation (32) and one to detect the X,Y position of the tilt (32').

## Claims

1. A speaker system, where the speaker units mounted in the speaker system may be configured into different positions to increase the acoustical performance perceived by the user, where said speaker system contains a mechanical structure consisting of four members:

   - a first member, where said first member may have any geometrical shape, where said member has a first surface and defining a circular innermost periphery of said first member;
   - a second member, where said second member may be arranged within the circular periphery provided on the first member, such that the second member may be rotate able around an axis perpendicular to, or close to being perpendicular to, the plane of the surface of the first member, and with the second member fully or partly having a material surface;
   - a third member being an integrated part of the second member or being a separate object mounted on top of the second member, and where said third member includes one or more speaker units mounted to deliver acoustical output directed away from the surface of the third member;
   - a fourth member, where said fourth member is support structure including a hinge for the third member and enables the third member to be tilt able around an axis horizontal to, or close to being horizontal to, the plane of the surface of the second member(2) and with the fourth member (4) attached to the second member(2).

2. A speaker system according to claim 1 wherein motor means controls the rotating of the second member and controls the tilting of the third member.

3. A speaker system according to claim 2 wherein the position of the speakers are obtained by passing information of X, Y coordinates related to the rotation of the second member to the second member motor means and by passing information of X, Y coordinates related to the tilting of the third member to the third member motor means.

4. A speaker system according to claim 3, wherein a predefined set of filter attributes are applied as the default correction filters to be in the signal path for each of the one or more speakers.

5. A speaker system according to claim 4, wherein one of the predefined set of X, Y coordinates defines the initial position of the second member.

6. A speaker system according to claim 4, wherein one of the predefined set of X, Y coordinates defines the initial position of the third member.

7. A speaker system according to claim 6, wherein the X, Y coordinates of the second member position may be forced to given values, and thus forced to a given position of the speaker, specified from an external control device.

8. A speaker system according to claim 6, wherein the X, Y coordinates of the third member position may be forced to given values, and thus forced to a given position of the speaker, specified from an external control device.

9. A speaker system according to claim 8, wherein a predefined plurality of individual set of X, Y coordinates are related

to the second member position and where a predefined plurality of individual set of other X, Y coordinates are related to the third member position and where an index is related to a set of corresponding filter attributes that applies in that specific speaker position.

**10.** A speaker system according to claim 9, wherein a predefined plurality of individual set of X, Y coordinates are related to the second member position and where a predefined plurality of individual set of other X, Y coordinates are related to the third member position and where an index is related to a set of corresponding filter attributes that applies in that specific speaker position and where the complete set of definitions may be replaced with data from an external source.

**11.** A speaker system according to claim 10, wherein the position of the second member and the position of the third member are determined from a detected maximum and or a detected minimum in a signal beam issued from a source located in the listening position of the user towards the speaker system.

**12.** A speaker system according to one or more of the claims above, wherein a predefined plurality of individual set of filter attributes are related to different speaker positions for each of the one or more speakers.

**13.** A speaker system according to one or more of the claims above, wherein a predefined set of filter attributes are selected and applied as the actual correction filter to be in the signal path for each of the one or more speakers, where the set of filter attributes are selected based on the X,Y position of the speaker.

**14.** A speaker system according to one or more of the claims above, wherein a predefined plurality of individual set of filter attributes related to speaker positions for each of the one or more speakers may be replaced with data from an external source.

**15.** Use of the speaker system according to any of the claims 1 to 14, implemented as a stand alone loudspeaker.

**16.** Use of the speaker system according to any of the claims 1 to 14, implemented as a built in loudspeaker, to be applied as in-wall loudspeaker, and/or as in-ceiling loudspeaker and/or as in-floor loudspeaker.

**17.** Use of the speaker system according to any of the claims 1 to 14, implemented as a loudspeaker in a home appliance and/or in media systems.

Figure 1

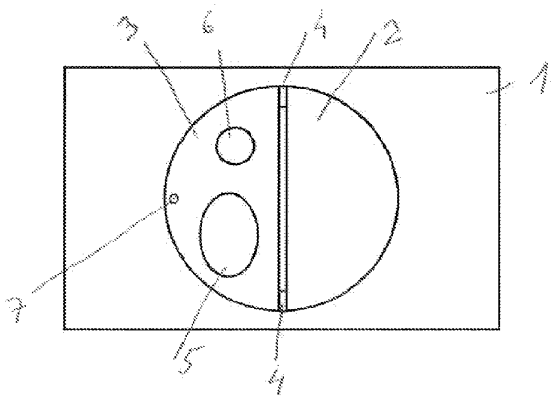



Figure 2

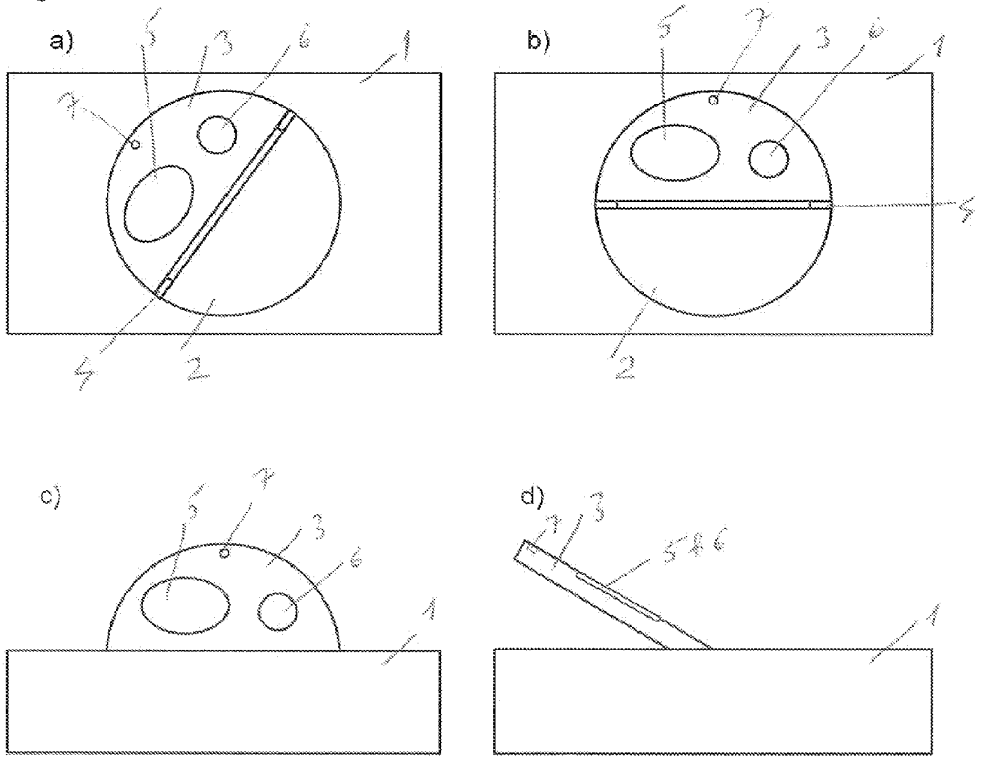


Figure 3

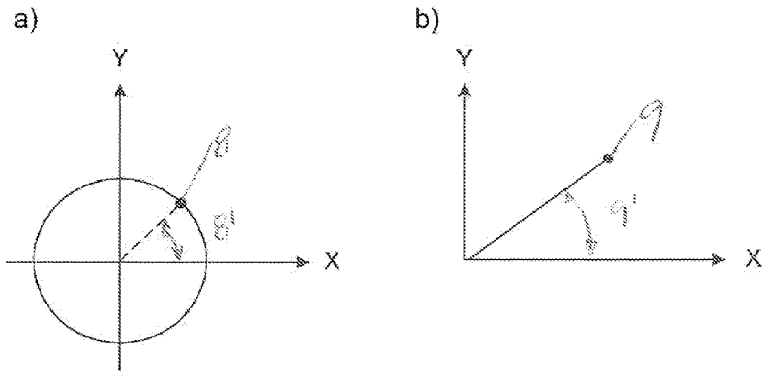



Figure 4

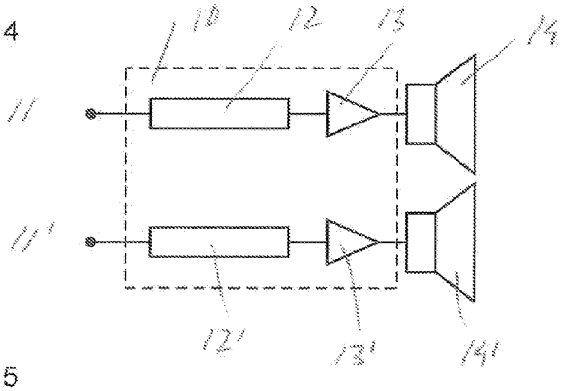



Figure 5

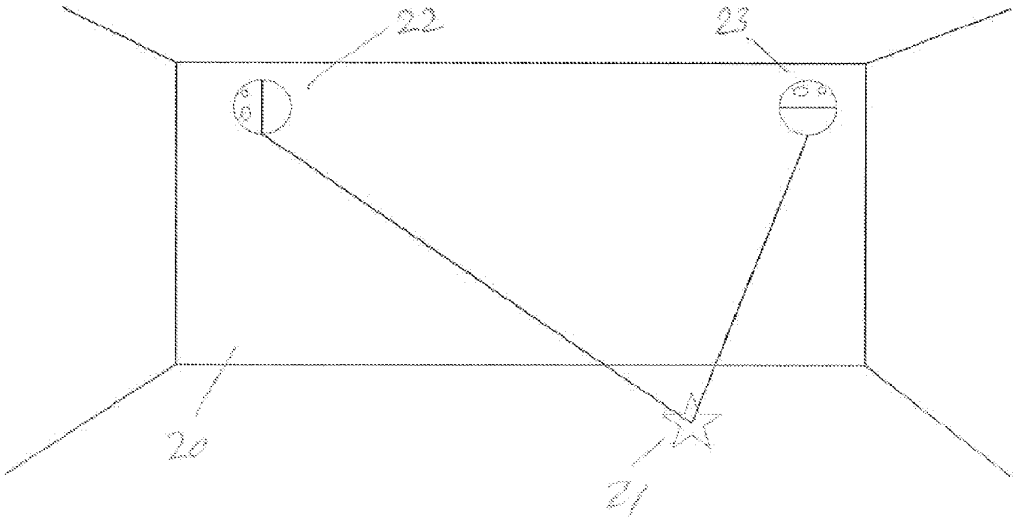
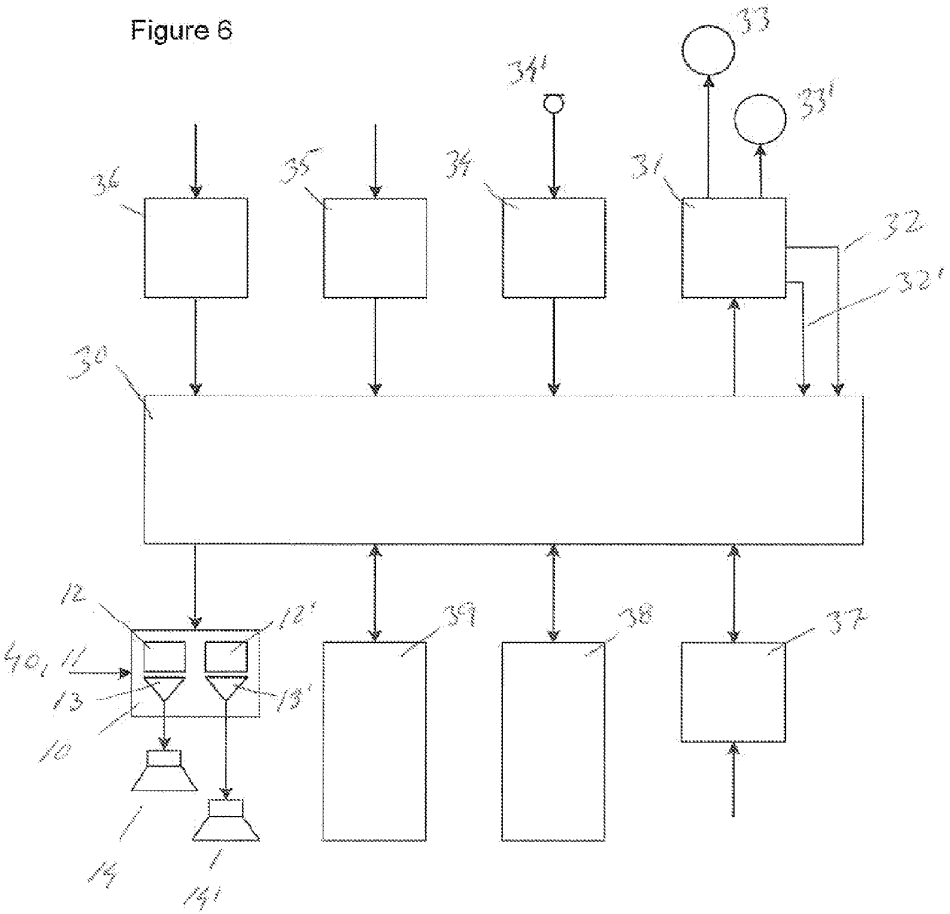


Figure 6



## REFERENCES CITED IN THE DESCRIPTION

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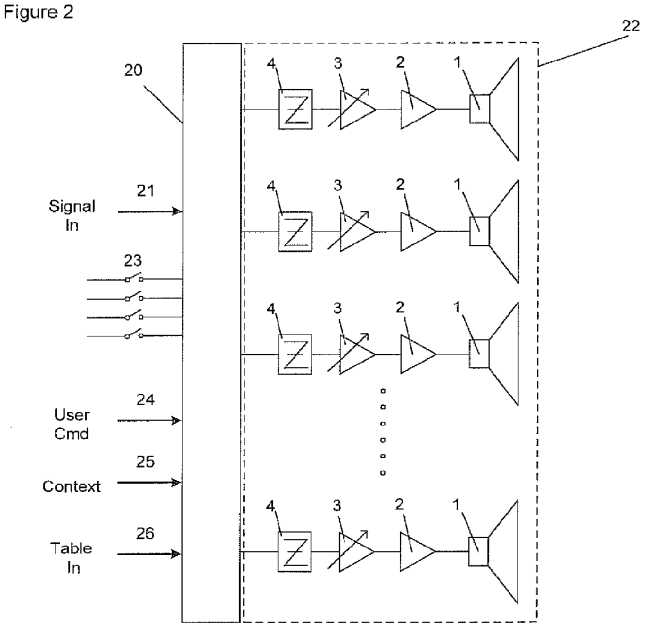
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## (54) Configuring a sound field

(57) The present invention relates to a method and system for dynamic reconfiguring an audio reproduction system comprising two or more sound channels. The premises of the reconfiguring are being based on the position of one or more listeners and the one or more sound channels in the reproduction system. The feature obtained is a sound distribution into individual zones of sound fields.

The reconfiguring means are based on a digital signal processor that configures the sound channels by adjusting the equalization, the delay and the gain according to individual listener's position in a room/space.

Figure 2




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EP 2 161 950 A2

## Description

### Field of the Invention

**[0001]** The present invention relates to a method and system for dynamic reconfiguring an audio reproduction system comprising two or more sound channels. The premises of the reconfiguring are being based on the position of one or more listeners and the one or more sound channels in the reproduction system. The feature obtained is a sound distribution into individual zones of sound fields.

**[0002]** The invention includes digital signal processing, sound transducers, filters and amplifier configurations to be applied in surround sound systems and traditional stereophonic system, and to be applied in any domain like a home, in a vehicle, in a boat, in an airplane, in an office or in any other private or public domain, this being airports, shopping centres, sports arenas and theatres, i.e. in a PA system.

### Background of the Invention

**[0003]** It is a well known problem in prior art loudspeaker systems operating in closed rooms/spaces e.g. a car, that the sound expired by the user may vary according to the listeners position in a space relative to the loudspeaker system transducers.

**[0004]** Furthermore systems have been developed for simplistic sound distribution, for example for use inside rooms or cars. The systems detect the configuration of the space and the presence of listeners, and reconfigure the sound output according to the number of listeners and their position relative to the loudspeakers. Such systems are disclosed in US2007/0211908, US2004/0240676 and DE102004022379.

### Object of the Invention

**[0005]** Thus to obtain a certain perceived quality level of a loudspeaker system, e.g. in a car, the individual sound channels incorporating one or more loudspeaker modules must be calibrated and adjusted individually and according to the number of persons in the car, and their position in the space e.g. their seated positions.

**[0006]** This principle may be applied in any type of room like airplanes, boats, theatres, arenas, and shopping centres and alike.

**[0007]** In the public domain applications it would be a huge advantage to direct the sound fields primarily into zones where people are located and /or seated, this to avoid acoustical reflections from distributed speakers in areas where no people are located.

### Description of the Invention

**[0008]** The invention discloses a surround sound system where different sound settings may be enabled via digital signal processing means controlling the individual sound channels parameters e.g. the equalization (filters), the delay, the gain (amplification). The premise for the control is based upon the listener's position in the listening room/space.

**[0009]** In a more advanced embodiment of the invention the control and sound setting may work in a contextual mode of operation to accommodate for:

- the position of the one or more listeners;
- a functional mode of operation, e.g. adjust the sound system settings to be in movie mode;
- the type of music, e.g. rock;
- the time of the day; e.g. morning/day/night/Christmas etc.

**[0010]** The invention discloses a solution that in an automatically mode of operation may fulfil the stated requirements and solve the related technical problems.

**[0011]** In summary the invention includes:

- sensor means to detect a listener position;
- a mode of operation related to a user position or a required function;
- Information available according to context (place, time and music content);
- multi channel sound system, e.g. two channels stereo, a 5.1 surround sound system;
- digital controlled sound system e,g. digital control of gain, equalization and delay;
- active speakers including amplifiers and filters for each loudspeaker transducer.

**[0012]** The digital control of the sound system is based on standard means for:

- gain: adjust the signal by a certain level, i.e. + /- xx dB, e.g. +0.1 dB;
- delay: the signal is delayed by a specific time, i.e. yy ms, e.g. 100 ms;
- EQ: the signal is filtered according to the Finite Impulse Response principle (FIR) or the signal is filtered according to the Infinite Impulse Response principle (iIR); a number of coefficients are specified; the number of parameters typically to be from 1 -> 1000.

**[0013]** The invention may be implemented in different embodiments, in which the alternative reconfiguring procedures may be implemented as:

- a traditional algorithm in terms of a sequential software program in which the values of the resulting adjustment parameters are embedded in the code itself; the algorithm validates according to a specified system structure of an actual loudspeaker configuration;
- a table based concept in which one or more tables defines the attributes to be applied per loudspeaker channel versus the mode of operation, the listener position and other context related information (e.g. time).

**[0014]** In a first aspect of the invention a method for automatic reconfiguring an audio reproduction system comprising two or more sound channels where the reconfiguring has the steps:

- determine the physical position of one or more listeners,
- apply the physical position as information to select a set of predefined or calculated (in situ) sound parameters, the set of parameters to include settings for equalization, gain and delay per sound channel,
- optionally apply other context related information to select a set of predefined sound parameters,
- optionally apply other user commanded information to select a set of predefined sound parameters, and
- provide the set of parameters per sound channel accordingly.

**[0015]** The fundamental goal of the invention is to enhance the perceived sound quality seen from a listener prospective. Regardless of the physical position of the loudspeakers, a virtual sound field may be generated and directed so it appears to be anywhere the listener may desire. This is obtained by adjusting the gain, the delay and the equalization parameters of the individual sound channels in a multichannel sound system.

**[0016]** In another aspect the reconfiguring process validates the position of the one or more users, and/or functional premises and/or context related premises and or content related premises as part of the reconfiguring of the one or more sound channels that constitutes the configured loudspeaker system, and where the validation prioritizes the position of one or more listeners.

**[0017]** According to specific requirements of a sound providing system miscellaneous features may be offered and controlled automatically and/or commanded by the user. The features may be used individually and/or mixed in a way that accommodates the user's demands. A predefined combination of sound settings per channel and the functional options supports the processing. Examples of functional options are:

- seat priority: driver, all, back, front, centre, left, right etc.;
- a persons physical position: in a room, in a car, in a PA domain etc.;
- zone priority: a zone includes one or more specific sound channels;
- mode priority: movie, music, speech;
- channel mode: stereo, surround sound 5.1, or other multi channel system of any order;
- group of people: one or more listeners in a zone;
- the time of an event.

**[0018]** The reconfiguring process is provided as one or more algorithms to provide the calculation of each of the values of the sound channel adjustment variables.

**[0019]** In a preferred embodiment the reconfiguring process is provided as a table with relations provided to be accessed by the digital signal processor to provide each of the values of the sound channel adjustment with variables.

The saved attributes and key parameters are loaded into the reconfiguring means supported by electronic means, means that is connected wirelessly or connected by wire to the audio reproduction system.

**[0020]** In a third aspect of the invention the reconfiguring process provides the settings of the sound parameters; gain, equalization and delay for one sound channel, to be applied in one sound field zone related to the physical position of first group of people including one or more listeners.

To accommodate for the handling of more zones including different groups of people the reconfiguring process provides

the settings of the sound parameters; gain, equalization and delay for one sound channel, to be applied in one sound field zone related to the physical position of one or more other groups of people including one or more listeners.

**[0021]** In yet another aspect a listener position is detected via standard sensor means like switches or infrared detectors or strain gauges or temperature sensitive detectors.

**[0022]** The configuring process is to be automatically executed and/or controlled by the audio amplifier means, including a digital signal processor, which drives the loudspeaker system. The reconfiguring means is embedded into an audio reproduction system.

**[0023]** In a preferred embodiment, the reconfiguring is controlled via a table mapping the mode of operation to adjustment parameters for each speaker in every channel or just relevant channels. The adjustment parameters are e.g. but not limited to: equalization, delay and gain.

**[0024]** The table may be represented as one or more data set as most appropriate to the digital controller unit. E.g. one data set may contain the relations among:

- listener position,
- loud speaker channel #,
- parameter settings (EQ, delay, and gain).

**[0025]** Another data set may contain the functional/mode related information like:

- functional settings (movie, audio only),
- loud speaker channel #,
- parameter settings (EQ, delay, and gain).

**[0026]** This table concept is considered to be a data driven control systems, and enables for easy updates of the functional behaviour of a specific system simply by loading alternative data set into the controller.

**[0027]** In addition, the invention includes a constraint Solver, which comprises a table with digital data representing the constraints of the passenger(s) position(s) and related acoustical adjustment, attributes and corresponding variable values.

The constraint solver processing enables an arbitrary access mode to information with no order of sequences required. This is an important advantage over prior art tree-like programming structure, where the starting point is given by the root of the tree. Especially, when finding ways from nodes within the tree-like program to a specific target location in the tree, it may be obscure with regard to which way to chose, whether backwards or forwards, and the final solution may be a new start from the root.

**[0028]** According to the invention, the product configuration domain table is organized as relations among variables in the general mathematical notation of 'Disjunctive Form':

AttribVariable 1.1 and AttribVariable 1.2 and AttribVariable 1.3 and Attrib Variable 1.n
Or AttribVariable 2.1 and AttribVariable 2.2 and AttribVariable 2.3 and Attrib-Variable 2.n
Or ....
Or ....
Or AttribVariable m.1 and AttribVariable m.2 and AttribVariable m.3 and AttribVariable m.n

**[0029]** For example, AttribVariable 1.1 may be defining a passenger seat position, AttribVariable 1.1 a speaker transducer unit, AttribVariable 1.3 a speaker system/subsystem and AttribVariable 1.n gain value for the transducer unit. In another example, AttribVariable 2.n may be a reference to another table.

**[0030]** An alternatively definition term is the 'Conjunctive Form':

AttribVariable 1.1 or AttribVariable 1.2 or AttribVariable 1.3 or AttribVariable 1.n
And AttribVariable 2.1 or AttribVariable 2.2 or AttribVariable 2.3 or AttribVariable 2.n
And ....
And ....
And AttribVariable m.1 or AttribVariable m.2 or AttribVariable m.3 or AttribVariable m.n

**[0031]** With this method of defining the problem domain, it becomes a multi-dimensional state space enabling equal and direct access to any point in the defined set of solutions. The term multidimensional has to be understood as a contrast to a tree-like programming structure, which is two-dimensional.

**[0032]** According to the invention, the product configuration function proceeds by finding the result of the interrogation in the set of allowed and possible combinations in one or more Configuration Constraint Tables. According to definitions

made in the configuration constraint tables, the result might be:

- a list of variables useful in the application e.g. gain, and filter setting i.e. equalization, for the one or more transducers;
- a list of variables useful in the application e.g. delay for the one or more transducers;
- a list of variables useful in the application to configure individual sound domains to related to zone of sound of targeted to one or more users.

**[0033]** Alternative configurations may be evaluated by the constraint solver, the alternatives being one or more of the defined set of legal combination in the constraint table.
The example illustrates alternative solutions for x, y when y is given:
**[0034]** The: If x Then y may be represented as x -> y
**[0035]** With the truth table:

| x | y | x->y |
|---|---|---|
| 0 | 0 | 1 |
| 0 | 1 | 1 |
| 1 | 0 | 0 |
| 1 | 1 | 1 |

Given the premise x is '1' the conclusion y is '1'.
Given the conclusion y is '1' the premises for x may be '1' or '0'.

Thus, when y is '1' the alternative for x are '1' or '0'.
**[0036]** Represented in a constraint table the x -> y has the legal combinations of x, y:

| x | y |
|---|---|
| 0 | 0 |
| 0 | 1 |
| 1 | 1 |

**[0037]** Table entries in a constraint table may be combined into legal/illegal combination such that all the well known logical operators known from the Boolean algebra will be included as required. The logical operators being: AND, OR, NOT, XOR, Logical Implication (->), Logical Bi-implication (=).
**[0038]** An example of a table definition is displayed below:

| Mode or position | Speaker channel # | Other (e.g. time, content) | Equalization EQ | Delay | Gain |
|---|---|---|---|---|---|
| Driver | 1 | | p-val-d1 | q-val-d1 | r-val-d1 |
| | 2 | | p-val-d2 | q-val-d2 | r-val-d2 |
| | ..... | | ..... | ..... | ..... |
| | n | | p-val-dn | q-val-dn | r-val-dn |
| | | | | | |
| Front | 1 | | p-val-f1 | q-val-f1 | r-val-f1 |
| | 2 | | p-val-f2 | q-val-f2 | r-val-f2 |
| | ..... | | ..... | ..... | ..... |
| | n | | p-val-fn | q-val-fn | r-val-fn |
| | | | | | |
| Rear | 1 | | p-val-r1 | q-val-r1 | r-val-r1 |
| | 2 | | p-val-r2 | q-val-r2 | r-val-r2 |

(continued)

| Mode or position | Speaker channel # | Other (e.g. time, content) | Equalization EQ | Delay | Gain |
|---|---|---|---|---|---|
| | ..... | | ..... | ..... | ..... |
| | n | | p-val-rn | q-val-rn | r-val-rn |
| | | | | | |
| All | 1 | | p-val-a1 | q-val-a1 | r-val-a1 |
| | 2 | | p-val-a2 | q-val-a2 | r-val-a2 |
| | .... | | ..... | ..... | ..... |
| | n | | p-val-an | q-val-an | r-val-an |
| | | | | | |
| Movie | 1 | | p-val-m1 | q-val-m1 | r-val-m1 |
| | 2 | | p-val-m2 | q-val-m2 | r-val-m2 |
| | ..... | | ..... | ..... | ..... |
| | n | | p-val-mn | q-val-mn | r-val-mn |
| ..... | ..... | | | | |
| Other | 1 | | p-val-o1 | q-val-o1 | r-val-o1 |
| | 2 | | p-val-o2 | q-val-o2 | r-val-o2 |
| | ..... | | ..... | ..... | ..... |
| | n | | p-val-on | q-val-on | r-val-on |

**[0039]** Thus in an aspect of the invention the reconfiguring means is embedded into an audio reproduction system. Thus the system becomes the controller of the re- configuring process that provides a reconfiguration of the system itself.

## Description of the Drawing

**[0040]** In the following, preferred embodiments of the invention will be described with reference to the drawings wherein:

Figure 1 displays components that constitute examples of loudspeaker module configurations, that represent one sound channel configuration;
Figure 2 displays an example of an embodiment of the invention displaying a plurality of sound channels;

**[0041]** Figure 1 display components that constitute examples of loudspeaker module configurations related to one sound channel.
A loudspeaker transducer unit (1) is the fundamental means that transforms the electrical signal to the sound waves produced by movements of the membrane of the transducer unit. Any standard transducer unit may be applied in the invention.
The characteristics of each loudspeaker transducer unit are determined by measurement and/or from specifications delivered by the supplier of the unit.
**[0042]** In the preferred embodiment an audio reproduction system comprising active sound transducers including an amplifier (2) is provided for each transducer unit (1). This type of amplifier is e.g. the technology ICEpower from Bang & Olufsen DK.
**[0043]** In a high quality audio reproduction system a dedicated filter means, an equalizer, (3) is provided per amplifier (2). The means (3) provides a frequency dependent amplification to control the overall gain, which may be regulated up or down as required. Means for down regulation may be as simple as adjustment of a resistive means serial connected to the loudspeaker module.
**[0044]** To control the sound distribution into individual zones of sound fields the sound delay among channels must be controlled. In a preferred embodiment the delay (4) is controlled individually per sound channel.
**[0045]** Figure 2 displays the example of an audio reproduction system comprising loudspeaker modules configured

in a multi channel concept e.g. a 5.1 surround sound system.
In fact any number of channels (22) may be handled; having a corresponding table complex related according to the actual functional system requirements.

**[0046]** The audio reproduction system may be an audio amplifier (20), including a digital signal processor, for controlling and driving the loudspeaker channels (22), and to provide a signal (21) that's amplified and filtered and delayed accordingly.

**[0047]** Input from sensor means (23) determines the mode and functional operation of the control system and may be of a different nature e.g. but not limited to: simple switch, accelerometer, infrared detection, thermal sensing etc.
In the preferred embodiment the sensors primarily detects the position of a user in a room/space, the position to be related to the sound field that's relevant for the one or more users /listeners.
E.g. in a vehicle the detection of a user's position is where the individual user is seated. The detection in this system may be via a simple switch in every seat, or via switches related to the security belts.

**[0048]** Additional control signals may be received as user commands (24), e.g. a command to 'enable automatic sound control' and a context related information (25), e.g. information about the time of the day and/or the type of music actual in play. The additional control signal information to be used as input into the digital signal processor to control mode and functional operation of the sound system.

**[0049]** In a preferred embodiment the reconfigure means is imbedded into the controller of the audio sound system. Thus the audio sound system is the master having the digital signal processor means (20) that initiates, controls and applies the reconfiguring process. Alternative table definitions may be loaded into the digital signal processor (20) from external means e.g. a laptop/PC (26).

**[0050]** The invention may be applied in relation to automatically adjusting an audio sound system to a maximum level of quality taking into account the position of individual listeners in dedicated zone of sound fields.

**[0051]** The invention includes sound channel configurations to be applied in surround sound systems and traditional stereophonic system, and to be applied in any domain like a home, in a vehicle, in an airplane in a boat, in an office or in any other public domain and alike.

## Claims

1. A method for dynamic and automatic reconfiguring an audio reproduction system comprising two or more sound channels where the reconfiguring has the steps:

   - determine the physical position of one or more listeners,
   - apply the physical position as information to select a set of predefined or calculated sound parameters, the set of parameters to include settings for equalization, gain and delay per sound channel and/or per loudspeaker transducer,
   - optionally apply other context related information to select a set of predefined sound parameters,
   - optionally apply other user commanded information to select a set of predefined sound parameters, and
   - provide the set of parameters per sound channel and/or per loudspeaker transducer accordingly,

   and where the reconfiguring method is **characterized by** a constraint solver, which constraint solver finds one or more legal combinations among defined legal combinations predefined in a constraint table.

2. A method according to claim 1, where the reconfiguring process validates the position of the one or more users, and/or functional premises and/or context related premises and/or content related premises as part of the reconfiguring of the one or more sound channels that constitutes the configured loudspeaker system, and where the validation prioritizes the position of the one or more listeners.

3. A method according to any preceding claim where the reconfiguring process provides the settings of the sound parameters; gain, equalization and delay for one sound channel, to be applied in one sound field zone related to the physical position of a first group of people including one or more listeners.

4. A method according to claim 3 where the reconfiguring process provides the settings of the sound parameters; gain, equalization and delay for one sound channel, to be applied in one sound field zone related to the physical position of one or more other groups of people including one or more listeners.

5. A method according to claim 1, where a listener's position is detected via sensor means like switches or infrared detectors or strain gauges or temperature sensitive detectors.

6. A method according to any preceding claim, where the reconfiguring means is embedded into an audio reproduction system.

7. A method according to claim 1,**characterised in that** the constraint table comprises digital data representing the constraints of the

    1) Passenger(s) position(s), and related acoustical adjustment, attributes and corresponding variable values, and/or
    2) Passenger(s) position(s)" loud speaker channel number, parameter settings (EQ, delay, gain) and/or
    3) Functional settings, such as movie,audio only, loudspeaker channel number, parameter settings (EQ, delay, gain).

8. A method according to claim 1, **characterised in that** the constraint table is configured as a multi dimensional state space, defining relations among variables in either disjunctive form or conjunctive form.

9. A audio system comprising means for carrying out the method according to any of claims 1 to 8, **characterised in that** the automatic reconfiguring is applied on an audio reproduction system comprising two or more sound channels, each channel being active and with individual means for equalization and amplification, the system to constitute an audio reproduction equipment in a room, in a vehicle, in an airplane, in a boat, in a PA system and alike.

Figure 1

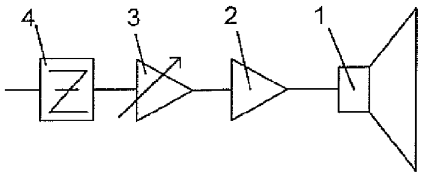
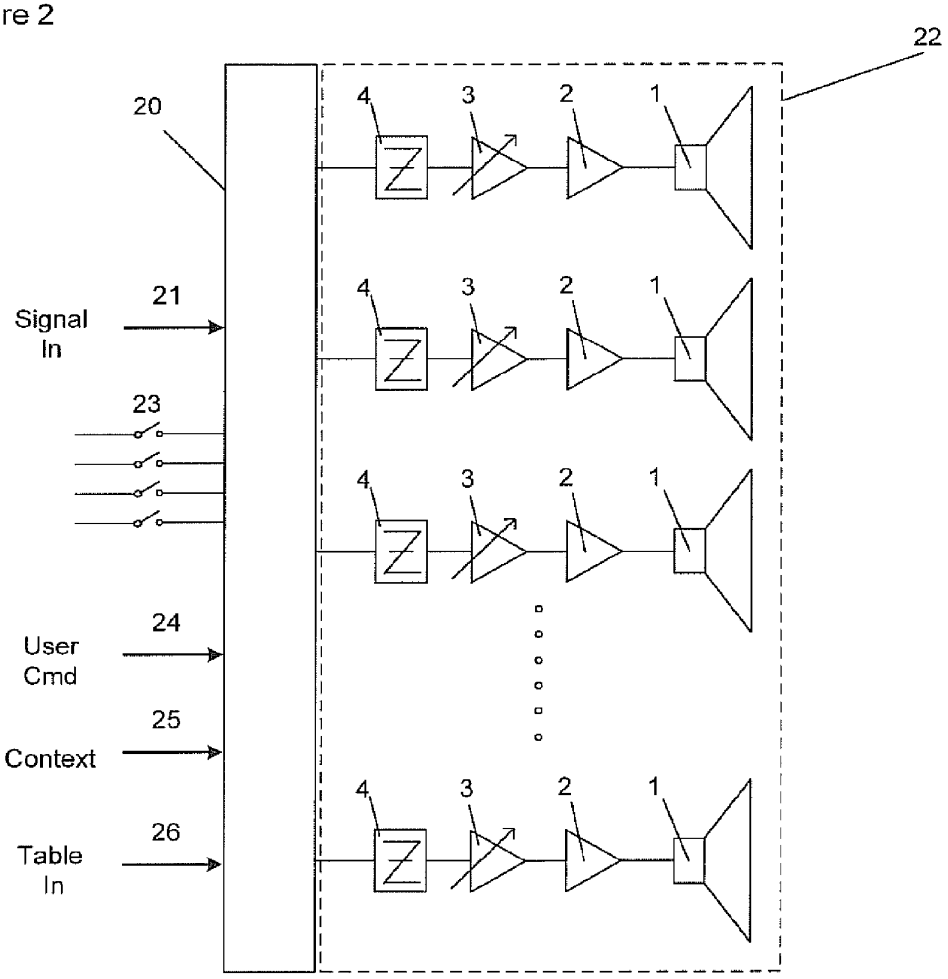



Figure 2



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(54) **ADAPTIVE SOUND FIELD CONTROL**

ADAPTIVE KLANGFELDSTEUERUNG

COMMANDE ADAPTATIVE DE CHAMP ACOUSTIQUE

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## Description

### TECHNICAL FIELD

**[0001]** The invention relates generally to a method and a system for controlling loudspeakers in a room and more specifically to such methods and systems optimised for use in small and/or closed enclosures, such as the cabin of a vehicle, for instance a car.

### BACKGROUND OF THE INVENTION

**[0002]** Methods and systems having the capability to adjust a speaker system to its environment are known within the art. Such methods and systems comprise for instance single point room equalization, obtained by measuring sound pressure in one point near the listening position and subsequent direct inverse filtering. Another prior art procedure comprises adjusting a loudspeaker to its acoustic environment and controlling the acoustic energy in the sound field. Still another procedure comprises adjusting the loudspeaker according to the listening position.

### SUMMARY OF THE INVENTION

**[0003]** The invention is defined by the appended claims.

**[0004]** The present invention differentiates from the prior art at least with respect to the following aspects:

- Adjustment of the performance in the full audible frequency range.
- According to the invention there are provided a number of individual options for adjustment, such as:
- Acoustic power output (distributed energy);
- Room gain, which may vary according to the actual room design;
- Optimal listening position;
- Listening position combined with supplemental measurements in several positions;
- Real-time adaption, by applying a subset of measurement points from the complete set of possible measurement points;
- Pre-shaped adjustments according to predefined knowledge data.

**[0005]** A specific embodiment of the method and system according to the invention will be described in detail in the following, but it is understood that other embodiments, for instance of the various functional entities used in the method and system would also be possible and would fall within the scope of the present invention which is defined by the appended claims.

### BRIEF DESCRIPTION OF THE DRAWINGS

**[0006]** The present invention will be better understood by reading the following detailed description of an embodiment of the invention in conjunction with the drawings, wherein:

Figure 1 shows the three main elements (the acoustic power output from the loudspeakers, the room gain and the listening position interface) of the present invention;

Figure 2 shows sampling of energy or power in a sound field in a room;

Figure 3 shows the measurement of room gain in a room or enclosure by using a special measurement loudspeaker that could be placed at any position in the room or enclosure;

Figure 4 shows an example of a special measurement loudspeaker placed in a car at one of the listening positions. The measurement loudspeaker is fitted with special means to allow easy and reproducible measurement of sound

pressure in two positions in the close near field of the loudspeaker diaphragm;

Figure 5 shows measuring the listening position interface at a particular listening position; and

Figure 6 shows real time adaptation that tracks changes of the energy or power in the sound field based on measurements of sound pressure at a subset of random positions, for instance three positions as shown in this figure.

DETAILED DESCRIPTION OF THE INVENTION

**[0007]** In the following, a specific embodiment of the invention will be described in detail, but it is understood that this embodiment only constitutes an example of how the general concepts of the present invention can be implemented in practice.

**[0008]** A basic concept of the present invention is that the total transmission path from the electrical input terminal(s) of the loudspeaker(s) to the sound pressure generated at the ears of a listener in an enclosure can be described to constitute three main elements: (i) the acoustic power emitted from the one or more loudspeakers into the enclosure when the one or more loudspeakers are provided with electrical input signals, (ii) the influence of the acoustic properties of the enclosure itself on the sound field created in the enclosure, i.e. on the distribution of sound pressure and hence on average sound pressure generated in the enclosure by the one or more loudspeakers emitting acoustic power into the enclosure, and (iii) the coupling or interface between the created sound field in the enclosure and a listener located at a given position in the enclosure. This is illustrated with reference to figure 1 that shows the three elements that participate in creating a sound field 10 in an enclosure 1 such as a listening room or automobile cabin. An example of how these three elements can be measured in practice is illustrated with reference to figures 2 through 6.

**[0009]** As shown in figure 1, one or more loudspeaker drive units 2, 3, 4 emit a total acoustic power into the sound field 10 depending on the coupling to the sound field 10 from each driver position and the interaction between the drive units. Depending on the acoustic properties of the listening room/enclosure, more or less power averaged sound pressure will be created in the room/enclosure for a given acoustic power output into the sound field. In order to characterize the influence of the room on the sound field generated herein, the quantity room gain is introduced. Room Gain is here defined as the ratio between the squared power averaged sound pressure in a room and the acoustic power into this room.

**[0010]** A listener's access to the sound field 10, i.e. his ability to receive sound energy from a sound field and at the specific place herein in which he is located, depends on the coupling to the sound field at the actual listening position. A listener is in figure 1 schematically indicated by the head 6. This coupling can be described by the radiation resistance at the listening position, for instance measured by placing a loudspeaker (14 in figures 3, 4 and 5) in the listening position and measuring the radiation resistance seen by this loudspeaker into the sound field.

**[0011]** Below follows a detailed description of methods for calculating the above three contributions to the total transmission path and how to determine an electronic filter for obtaining a specific target transmission from the electrical input to the loudspeakers to the ears of the listener.

**[0012]** Figure 2 shows how the energy or power in a sound field can be measured by power averaging a number of measured sound pressures at random positions 9 scattered across the entire space in both x, y and z directions (length, width and height directions). It is understood that although the figures represent the sound field in only two dimensions, the actual field will of course be three-dimensional, and measurement points generally should be distributed throughout the three-dimensional space. Equation I below shows how to calculate the power averaged sound pressure. The number of random positions must be higher than 1 and in a preferred embodiment it will be 9 positions, but good results can be obtained with 4 positions.

$$p_{channel\_average} = \sqrt{\frac{\sum_{i=1}^{N} \left| p_{channel\_i}(f) \right|^2}{N}} \qquad (1)$$

**[0013]** $p_{channel\_average}$ is the power averaged sound pressure for a given content channel, e.g. front left channel. $p_{channel\_i}$ is the measured transfer function from the input 5 to a power amplifier (not shown)to the sound pressure at the i'th random position, for instance the one designated by 9' in figure 2.

**[0014]** Figure 3 illustrates a method of measuring the room gain in a room/enclosure by using a special measurement loudspeaker 14 that can be placed anywhere in the room.

**[0015]** After placing the special measurement loudspeaker 14 at a chosen position in the room/enclosure as shown

in figure 3, sound pressure at a number of random positions I 1 is measured while emitting acoustic signals through the measurement loudspeaker 14. Equation 2 shows how to calculate the power averaged sound pressure $p_{RG\_average}$ of the sound pressures at these random positions.

$$p_{RG\_average} = \sqrt{\frac{\sum_{i=1}^{N} |p_{RG\_i}(f)|^2}{N}} \quad (2)$$

**[0016]** $p_{RG\_average}$ is the power averaged sound pressure when emitting acoustic signals through the special measurement loudspeaker 14 (the abbreviation RG stands for Room Gain). Figure 4 shows a practical example of such a special measurement loudspeaker mounted at a specific location in an automobile cabin. $p_{RG\_i}$ is the transfer function between the inputs to the power amplifier to the measured sound pressure at the i'th random position. (It should be noted that throughout this specification, all generated sound pressures are normalised with respect to the input voltage to the respective amplifiers. It is hence correct to designate for instance the quantity $p_{RG\_i}$ as a transfer function).

**[0017]** While keeping the measurement loudspeaker 14 in the same position (see figure 3), the transfer function from the input of the power amplifier to the sound pressure at two positions 12 and 13 differently spaced from the loudspeaker diaphragm but both in the very near field of the diaphragm is then measured. The distance from the diaphragm to the closest position 12, in which position the sound pressure $p_1$ is measured, could be e.g. 4 cm while the distance to the other position, in which position the sound pressure $p_2$ is measured, could be e.g. 9 cm. Equation 3 shows how to calculate the mechanical radiation resistance, $R_{m,s} = Re(Zm,r)$, from the two sound pressures $p_1$ and $p_2$ in the near field of the measurement loudspeaker 14.

$$R_{m,s} = \mathrm{Re}\left( j \cdot g \cdot f \cdot \frac{p_1}{p_1 - p_2} \right) \quad (3)$$

**[0018]** g is a real valued constant describing the scaling due to geometry etc. But g is unimportant in the application and can be set to 1.

**[0019]** Figure 4 displays one example of a special measurement loudspeaker 14 placed in a car at one of the listening positions. The measurement loudspeaker 14 is fitted with special means 15 to allow easy and reproducible measurement of sound pressure in two positions in the close near field of the loudspeaker diaphragm.

**[0020]** After calculating the mechanical radiation resistance from equation 3 it is possible to calculate the acoustic power output using equation 4.

$$Pa_{RG\_actual} = \frac{1}{2} \cdot R_{m,r} \cdot |v_{RG}|^2 \quad (4)$$

**[0021]** $v_{RG}$ is the diaphragm velocity of the measurement loudspeaker, which can be estimated from the difference between the two near field sound pressures $p_1$ and $p_2$ as given in equation 5. As for the constant g mentioned above, h is also a real valued constant, which is a function of geometry, out which can be set to I here.

$$v_{RG} \approx h \cdot \frac{1}{j\omega} \cdot (p_1 - p_2) \quad (5)$$

**[0022]** The Room Gain in the actual room/enclosure can now be calculated from the definition given by equation 6.

$$Room\ Gain = \frac{p_{RG\_average}^2}{Pa_{RG\_actual}} \quad (6)$$

**[0023]** Figure 5 shows how the special measurement loudspeaker 14 is used to determine the listening position interface at a particular listening position. This measurement can be repeated for as many listening positions as desired. Individual filters can then be designed for each listening position or an average filter can be designed. According to a specific embodiment of the invention, the listening position interface filter is left out, whereby a global equalizing can then be designed. The listening position interface and the corresponding part of the speaker equalization filter, Listener(f), is hence to be regarded as an option.

**[0024]** The listening position interface is obtained from a similar measurement of two sound pressures at positions 12 and 13, respectively, in near field of the measurement loudspeaker. Again equation 3 can be used to calculate the mechanical radiation resistance from the two measured sound pressures.

Adaptive Sound Field Control Equalization Filters:

**[0025]** The total equalization filter is split into two main components: a speaker equalization filter and a listening position interface equalization filter as described in equation 7.

$$ASFC(f) = Speaker(f) \bullet Listener(f) \tag{7}$$

**[0026]** The speaker equalization filter ensures generation of a desired sound field in the room/enclosure while the listening position interface equalization filter compensates for the actual access to the generated sound field.

**[0027]** The total acoustic power output from the loudspeaker driver(s) for a given content channel can be calculated from the power averaged sound pressure and the measured Room Gain by using equation 8.

$$Pa_{channel\_actual} = \frac{p^2_{channel\_average}}{Room\ Gain} \tag{8}$$

**[0028]** Then the speaker equalization filter can be calculated from equation 9.

$$Speaker(f) = \sqrt{\frac{Pa_{Adaptive\ Target}(f)}{Pa_{channel\_actual}(f)}} \tag{9}$$

**[0029]** $Pa_{Adaptive\ Target}$ is a desired target function for the acoustic power output, which may be fixed, selectable or adaptive as a function of the measured total acoustic power output. This target function may also include the difference between a desired Room Gain and the actual Room Gain measured in the room/enclosure. A desired Room Gain may also be fixed, selectable or adaptive to the actual room. According to one embodiment of the invention, the desired Room Gain is equal to the actual Room Gain, i.e. preserving the natural Room Gain in the actual room. An alternative embodiment is to use a desired Room Gain equal to the Room Gain in a particular room of choice, e.g. an IEC 268-13 standard listening room.

**[0030]** A procedure of pre-shaping and aligning the response of the loudspeakers in the room/enclosure may precede all the measurements described in this document. This is equivalent to designing the basic loudspeaker in a particular room different or equal to the room of usage before applying this procedure for adapting to the actual room/enclosure of usage. E.g. a general trend of decreasing level with increasing frequency can be imposed onto the loudspeaker system before starting the described procedure for adapting the loudspeaker to the room/enclosure. Another example is performing dedicated equalization on a specific loudspeaker driver to correct known problems with that loudspeaker driver, which may be independent of the actual room of usage. Also specific equalization in the actual room/enclosure of usage may be applied before the room adaptation procedure is started.

**[0031]** Equation 10 gives the listening position interface equalization filter target.

$$Listener(f) = \sqrt{\frac{R_{m,r,reference\ listening\ position}(f)}{R_{m,r,actual\ listener\ postion}(f)}} \quad (10)$$

**[0032]** The radiation resistance in a reference listening position, $R_{m,r,reference\_listening\_position}$ can be measured in a listening position where the access to the sound field is considered to be optimal. E.g. a listening position where the step of pre-shaping and equalization before the procedure of adapting to the room/enclosure is optimized may be used for this reference. A preferred embodiment is, however, to use $R_{m,r,reference\_listening\_position}$ equal to the radiation resistance in free field because in free field, a listener has equal access to all frequencies. The theoretical radiation resistance in free field for a point source is frequency squared multiplied by a constant depending on geometry.

**[0033]** Equation 11 now gives the complete equalization filter for an Adaptive Sound Field Control (ASFC) system according to the described embodiment of the invention.

$$ASFC(f) = \sqrt{\frac{Pa_{Adaptive\ Target}(f) \bullet R_{m,r,reference\ listening\ position}(f)}{Pa_{channel\_actual}(f) \bullet R_{m,r,actual\ listener\ postion}(f)}} \quad (11)$$

**[0034]** A special case is when no specific listening position is considered, i.e. equalization globally valid to the whole room/enclosure. Then the total equalization filter reduces to the speaker equalization filter, as in equation 12.

$$ASFC(f) = \sqrt{\frac{Pa_{Adaptive\ Target}(f)}{Pa_{channel\_actual}(f)}} \quad (12)$$

Real time adaptation

**[0035]** Another aspect of the present invention is the possibility of real time adaption to any changes of loudspeaker drivers and acoustic properties of the room/enclosure. Loudspeaker drivers are known to change as a function of aging and environment changes like temperature and humidity. Also playing loud music will heat the loudspeaker drive units and in particular the voice coils, which will also change the characteristics of the drive units,

**[0036]** Changing the acoustic properties of the room/enclosure can occur for numerous reasons, for instance as a consequence of how many people are present in the room/enclosure, opening or closing a window/door, opening or closing the roof in a car, fitting more or less furniture/baggage etc. into the room/enclosure. Using room adaptation according to the present invention provides a new possibility of tracking such changes in real time. The whole procedure can be repeated under different configurations, e.g. open/closed windows, and the corresponding equalization filters can be stored and selected manually or automatically when the same configuration happens during use. Alternatively, the whole or a part of the procedure can be performed during actual use in the actual configuration.

**[0037]** According to a preferred embodiment of the present invention, a subset of the random positions is chosen that has been proved to contain the major part of information obtained by the full set of random positions. Experiments show that a subset of 3 positions can be selected to track the changes due to changes in loudspeaker drive units and/or acoustic properties in the room/enclosure. This is shown in figure 6.

**[0038]** The three positions are sufficient when combining with the knowledge obtained in the full set of random positions in an initial design or calibration step. The initial or calibration step may be a collection of measurements in different configurations that can be manually selected or automatically selected when the configuration changes.

**[0039]** Figure 6 shows a real time adaptation tracking changes from measurement of sound pressure at a subset of random position, e.g. three positions.

**[0040]** In order to be able to carry out the adaptation in real time, i.e. during actual operation of for instance an automobile, those parts of the filter that are determined by means of the dedicated measurement loudspeaker 14 either located at the described position used for determining room gain RG(f) or for determining the listening position interface,

are preferably pre-recorded during an initial or calibration phase, as the measurement of p1 and p2 in front of the measurement loudspeaker and/or the use of a measurement loudspeaker at different positions in the enclosure would be difficult or in some situations even impossible to implement during actual operation. Hence, according to a preferred embodiment of the invention, in an initial or calibration phase these quantities are determined for all relevant conditions in the particular enclosure, whereas the acoustic power output from the one or more loudspeakers 2, 3, 4 can be estimated during actual operation, for instance by means of the simplified three-microphone setup shown in figure 6, which only applies three microphones, whereas a larger number of microphones (or measurement positions) is typically used in the initial or calibration phase. With reference to figures 2 and 3, respectively, nine measurement positions are used in this phase.

**[0041]** For instance, an event can activate the adaption procedure to take place. The event is a trigger to start the adaption algorithm and to perform the measurements, with the three microphones for instance, the calculations and the adjustments accordingly. The trigger may be of different types according to actual product requirements e.g. but not limited to: a) automatically when the car is entered or the engine is started, or b) upon a specific control command given by the user.

**[0042]** The command given by the user may be e.g. a pressure on button, a touch on a touch panel, a spoken command or a given gesture from a hand or the like.

**[0043]** The information about the mode of the adaption procedure may be displayed, with an indication of the transition from off -> initiated -> completed -> active. The type of display may e.g. be a LCD screen, an OLED panel, an LED or the like.

**[0044]** In the preferred embodiment, a combined key input device (switch button) and display device (an LED with multiple colour mode indications) constitute the user interface to the adaption procedure.

## Claims

1. A method for determining an equalization filter for one or more loudspeakers provided in an enclosure, such as a listening room or an automobile cabin, the method comprising the steps of:

   (i) providing said one or more loudspeakers (2, 3, 4) with an audio input signal (5) whereby a sound field (10) is generated in the enclosure (1), and determining a power averaged sound pressure emitted from the one or more loudspeakers (2, 3, 4) into said enclosure (1) by power averaging a number of measured sound pressures at a first set of positions (9) in the enclosure (1);
   (ii) determining a room gain RG(f) of the enclosure (1), by

   - placing a measurement sound source (14) at a measurement position in said enclosure (1);
   - determining a power averaged sound pressure emitted by said measurement sound source (14) into said enclosure by power averaging a number of measured sound pressures at a second set of positions (11);
   - measuring sound pressures $p_1$ and $p_2$, respectively, at two positions (12) and (13), respectively, in the near field of the measurement sound source (14);
   - based on the measured sound pressures at said two positions (12, 13), calculating a mechanical radiation resistance in the near field of the measurement sound source (14);
   - based on said mechanical radiation resistance, calculating the acoustic power output from the measurement sound source (14); and
   - calculating said room gain RG(f) of the enclosure (1) to the generated sound field (10) as the ratio between the square of the power averaged sound pressure emitted by the measurement sound source (14) and said acoustic power output from the measurement sound source (14).

   (iii) forming a speaker equalization filter (Speaker(f)) as the square root of a ratio between a target acoustic power output and the actual acoustic power output from the loudspeaker driver(s), which actual acoustic power output is calculated as the square of the power averaged sound pressure divided by the room gain RG(f);
   (iv) determining said equalization filter as said speaker equalization filter (Speaker(f)).

2. The method according to claim 1, further comprising:

   - determining a listening position interface equalization filter (Listener (f)) for a specific listening position in the sound field by:

   placing a measurement sound source (14) at this specific listening position in said enclosure, and
   measuring sound pressures $p_1$ and $p_2$, respectively, at two positions (12) and (13), respectively, in the near

field of the measurement sound source (14)
based on the measured sound pressures at said two positions (12, 13), calculating a mechanical radiation resistance in the near field of the measurement sound source (14);
determining the listening position interface equalization filter as the square root of a ratio between the mechanical radiation resistance determined at a reference listening position and the mechanical radiation resistance determined at said specific listening position; and

- determining said equalization filter as the product of said speaker equalization filter (Speaker(f)) and said listening position interface equalization filter (Listener(f)).

3. A method according to claim 2, wherein said reference listening position is a position in free field.

4. A method according to any of the preceding claims, comprising the steps of:

(i) during an initial or calibration phase, measuring said room gain RG(f) and optionally the listening position interface equalization filter for different conditions of said enclosure and storing the measurement results in storage means;
(ii) either during said initial or calibration phase determining said power average of measured sound pressures for one or more of said different conditions of said enclosure and storing the measurement results in storage means;
or during said initial or calibration phase determining said power average of measured sound pressures for one condition, such as a reference condition, of said enclosure and storing the measurement result in storage means and during actual use of the loudspeakers (2, 3, 4) in the enclosure carrying out measurements of said sound pressures for up-dating the power averaged sound pressures, thereby to carry out up-dating of characteristics of said equalization filter to correspond to changed conditions of the enclosure.

5. A method according to claim 4, wherein the number $N_u$ of measurement positions used for real-time updating of the filter characteristic is less than the corresponding number N of measurement positions used in the initial or calibration phase.

6. A method according to claim 5, wherein $N_u$ is equal to 3.

7. A system for determining an equalization filter for one or more loudspeakers provided in an enclosure, such as a listening room or an automobile cabin, the system comprising:

(a) one or more microphones for measuring sound pressure at a first set of positions (9) and a second set of positions (11) in a sound field (10) in the enclosure;
(b) a measurement sound source (14) that can be placed at chosen positions in said sound field (10) in said enclosure (1);
(c) means for determining a power averaged sound pressure emitted from the one or more loudspeakers (2, 3, 4) into said enclosure (1) by power averaging a number of measured sound pressures at said first set of positions (9);
(d) means for determining a room gain RG(f) of the enclosure (1) by:

determining a power averaged sound pressure emitted by said measurement sound source (14) into said enclosure by power averaging a number of measured sound pressures at said second set of positions (11);
calculating a mechanical radiation resistance in the near field of the measurement sound source (14) based on measured sound pressures $p_1$ and $p_2$ at two positions (12, 13) in the near field of the measurement sound source (14);
calculating the acoustic power output from the measurement sound source (14) based on said mechanical radiation resistance; and
calculating said room gain RG(f) of the enclosure (1) to the generated sound field (10) as the ratio between the square of the power averaged sound pressure emitted by the measurement sound source (14) and said acoustic power output from the measurement sound source (14),

(e) means for forming a speaker equalization filter (Speaker(f)) as the square root of a ratio between a target acoustic power output and the actual acoustic power output from the loudspeaker driver(s), which actual acoustic power output is calculated as the square of the power averaged sound pressure divided by the room gain RG(f);

(f) means for determining said equalization filter characteristic as said speaker equalization filter (Speaker(f)).

8. The system in claim 7, further comprising means for determining a listening position interface equalization filter (Listener (f)) for a specific listening position in the sound field by:

calculating a mechanical radiation resistance in the near field of the measurement sound source (14) based on measured sound pressures at two positions (12, 13) in the near field of the measurement sound source (14) placed in a specific listening position in said enclosure, and
determining the listening position interface equalization filter as the square root of a ratio between the mechanical radiation resistance determined at a reference listening position and the mechanical radiation resistance determined at said specific listening position; and
wherein said means for determining said equalization filter are arranged to determine said equalization filter as the product of said speaker equalization filter (Speaker(f)) and said listening position interface equalization filter (Listener(f)).

9. A system according to claim 7 or 8, further comprising means for storing said speaker equalization filter, Speaker(f), and optionally said listening position interface equalization filter, Listener(f) corresponding to different conditions of said enclosure (1), or means for storing those quantities that are derived from measurements of said sound pressures in the enclosure and that are used for determining the speaker equalization filter, Speaker(f), and a listening position interface equalization filter, Listener(f).

10. A system according to claim 9, further comprising a set of microphones that can carry out real time measurements of sound pressure during use of the enclosure and use these measurements together with appropriately stored quantities to determine real time changes of characteristics of said equalization filter or said speaker equalization filter, Speaker(f), and optionally a listening position interface equalization filter, Listener(f).

11. A system according to claim 9 or 10 further comprising means for triggering said real time changes of equalization filter characteristics, for instance when the acoustic properties of the enclosure change, or when the acoustic properties of the loudspeakers (2, 3, 4) that create the acoustic field (10) in the enclosure (1) change.

12. A system according to claim 11, wherein said triggering is performed manually by an operator, such as by the driver or a passenger in a car.

13. A system according to claim 11, wherein said triggering is performed automatically, for instance by opening of a window in a car or when the number of persons in the cabin is changed.

14. The system according to any one of claims 7 to 13, wherein said enclosure is the cabin of vehicle, such as a car.

15. Use of the system according to any of the claims 7 to 14 for implementing the method according to any of the claims 1 to 6.

**Patentansprüche**

1. Verfahren zum Bestimmen eines Entzerrungsfilters für einen oder mehrere Lautsprecher, die in einer Umfassung, z.B. in einem Hörsaal oder der Kabine eines Automobils, bereitgestellt werden, wobei das Verfahren die folgenden Schritte umfasst:

(i) Versehen des einen oder der mehreren Lautsprecher (2, 3, 4) mit einem Audioeingangssignal (5), wodurch ein Klangfeld (10) in der Umfassung (1) erzeugt wird, und Bestimmen eines über die Leistung gemittelten Schalldrucks, der aus dem einen oder den mehreren Lautsprechern (2, 3, 4) in die Umfassung (1) emittiert wird, durch Mitteln einer Anzahl gemessener Schalldrücke an einer ersten Gruppe von Positionen (9) in der Umfassung (1) über die Leistung;
(ii) Bestimmen einer Raumverstärkung (Room Gain) RG(f) der Umfassung (1) durch

- Anordnen einer Messtonquelle (14) an einer Messposition in der Umfassung (1);
- Bestimmen eines über die Leistung gemittelten Schalldrucks, der aus der Messtonquelle (14) in die Umfassung emittiert wird, durch Mitteln einer Anzahl gemessener Schalldrücke an einer zweiten Gruppe von

Positionen (11) über die Leistung;
- Messen von Schalldrücken *p1* bzw. *p2* an zwei Positionen (12) bzw. (13) im Nahbereichsfeld der Messtonquelle (14);
- Berechnen eines mechanischen Strahlungswiderstands im Nahbereichsfeld der Messtonquelle (14) auf der Grundlage der gemessenen Schalldrücke an den zwei Positionen (12, 13);
- Berechnen der akustischen Leistungsausgabe aus der Messtonquelle (14) auf der Grundlage des mechanischen Strahlungswiderstands und
- Berechnen der Raumverstärkung RG(f) der Umfassung (1) für das erzeugte Klangfeld (10) als das Verhältnis zwischen dem Quadrat des über die Leistung gemittelten Schalldrucks, der aus der Messtonquelle (14) emittiert wird, und der akustischen Leistungsausgabe aus der Messtonquelle (14);

iii) Bilden eines Lautsprecher-Entzerrungsfilters (Lautsprecher(f)) als die Quadratwurzel aus einem Verhältnis zwischen einer angestrebten akustischen Leistungsausgabe und der tatsächlichen akustischen Leistungsausgabe aus dem (den) Lautsprechertreiber(n), wobei die tatsächliche akustische Leistungsausgabe als das Quadrat des über die Leistung gemittelten Schalldrucks, dividiert durch die Raumverstärkung RG(f), berechnet wird;
iv) Bestimmen des Entzerrungsfilters als der Lautsprecher-Entzerrungsfilter (Lautsprecher(f)).

**2.** Verfahren nach Anspruch 1, ferner umfassend:

- Bestimmen eines Hörpositions-Schnittstellen-Entzerrungsfilters (Hörer(f)) für eine spezielle Hörposition in dem Klangfeld durch:

Anordnen einer Messtonquelle (14) an dieser speziellen Hörposition in der Umfassung und
Messen von Schalldrücken *p1* bzw. *p2* an zwei Positionen (12) bzw. (13) im Nahbereichsfeld der Messtonquelle (14);
Berechnen eines mechanischen Strahlungswiderstands im Nahbereichsfeld der Messtonquelle (14) auf der Grundlage der gemessenen Schalldrücke an den zwei Positionen (12, 13);
Bestimmen des Hörpositions-Schnittstellen-Entzerrungsfilters als die Quadratwurzel eines Verhältnisses zwischen dem mechanischen Strahlungswiderstand, bestimmt an einer Referenz-Hörposition, und dem mechanischen Strahlungswiderstand, bestimmt an der speziellen Hörposition; und

- Bestimmen des Entzerrungsfilters als das Produkt aus dem Lautsprecher-Entzerrungsfilter (Lautsprecher(f)) und dem Hörpositions-Schnittstellen-Entzerrungsfilter (Hörer(f)).

**3.** Verfahren nach Anspruch 2, wobei die referenz-Hörposition eine Position in einem freien Feld ist.

**4.** Verfahren nach einem der vorhergehenden Ansprüche, welches die folgenden Schritte umfasst:

(i) Messen der Raumverstärkung RG(f) und gegebenenfalls des Hörpositions-Schnittstellen-Entzerrungsfilters für verschiedene Bedingungen der Umfassung und Speichern der Messergebnisse in einem Speichermittel während einer Anfangs- oder Kalibrierungsphase;
(ii) entweder Bestimmen des Leistungsmittelwerts gemessener Schalldrücke für eine oder mehrere der verschiedenen Bedingungen der Umfassung und Speichern der Messergebnisse in einem Speichermittel während der Anfangs- oder Kalibrierungsphase oder Bestimmen des Leistungsmittelwerts gemessener Schalldrücke für eine Bedingung, z.B. eine Referenzbedingung, der Umfassung und Speichern der Messergebnisse in einem Speichermittel während der Anfangs- oder Kalibrierungsphase und Durchführen von Messungen der Schalldrücke zum Aktualisieren der über die Leistung gemittelten Schalldrücke während der tatsächlichen Verwendung der Lautsprecher (2, 3, 4) in der Umfassung, um dadurch eine Aktualisierung von Eigenschaften des Entzerrungsfilters durchzuführen, damit diese veränderten Bedingungen der Umfassung entsprechen.

**5.** Verfahren nach Anspruch 4, wobei die Anzahl $N_u$ an Messpositionen, die für die Echtzeitaktualisierung der Filtereigenschaften verwendet werden, geringer als die entsprechende Anzahl N an Messpositionen ist, die in der Anfangs- oder Kalibrierungsphase verwendet werden.

**6.** Verfahren nach Anspruch 5, wobei $N_u$ gleich 3 ist.

**7.** System zum Bestimmen eines Entzerrungsfilters für einen oder mehrere Lautsprecher, die in einer Umfassung, z. B. einem Hörsaal oder in der Kabine eines Automobils, bereitgestellt werden, wobei das System das Folgende

umfasst:

(a) ein oder mehrere Mikrofone zum Messen des Schalldrucks an einer ersten Gruppe von Positionen (9) und einer zweiten Gruppe von Positionen (11) in einem Klangfeld (10) in der Umfassung;
(b) eine Messtonquelle (14), welche an ausgewählten Positionen in dem Klangfeld (10) in der Umfassung (1) angeordnet sein kann;
(c) ein Mittel zum Bestimmen eines über die Leistung gemittelten Schalldrucks, der aus dem einen oder den mehreren Lautsprechern (2, 3, 4) in die Umfassung (1) emittiert wird, durch Mitteln einer Anzahl gemessener Schalldrücke an der ersten Gruppe von Positionen (9) über die Leistung;
(d) ein Mittel zum Bestimmen einer Raumverstärkung RG(f) der Umfassung (1) durch:

Bestimmen eines über die Leistung gemittelten Schalldrucks, der durch die Messtonquelle (14) in die Umfassung emittiert wird, durch Mitteln einer Anzahl gemessener Schalldrücke an einer zweiten Gruppe von Positionen (11) über die Leistung;
Berechnen eines mechanischen Strahlungswiderstands im Nahbereichsfeld der Messtonquelle (14) auf der Grundlage der gemessenen Schalldrücke $p_1$ und $p_2$ an zwei Positionen (12, 13) im Nahbereichsfeld der Messtonquelle (14);
Berechnen der akustischen Leistungsausgabe aus der Messtonquelle (14) auf der Grundlage des mechanischen Strahlungswiderstands und
Berechnen der Raumverstärkung RG(f) der Umfassung (1) für das erzeugte Klangfeld (10) als das Verhältnis zwischen dem Quadrat des über die Leistung gemittelten Schalldrucks, der durch die Messtonquelle (14) emittiert wird, und der akustischen Leistungsausgabe aus der Messtonquelle (14),

(e) ein Mittel zum Bilden eines Lautsprecher-Entzerrungsfilters (Lautsprecher(f)) als die Quadratwurzel aus einem Verhältnis zwischen einer angestrebten akustischen Leistungsausgabe und der tatsächlichen akustischen Leistungsausgabe aus dem (den) Lautsprechertreiber(n), wobei die tatsächliche akustische Leistungsausgabe als das Quadrat des über die Leistung gemittelten Schalldrucks, dividiert durch die Raumverstärkung RG(f), berechnet wird;
(f) ein Mittel zum Bestimmen der Entzerrungsfiltereigenschaft als der Lautsprecher-Entzerrungsfilter (Lautsprecher(f)).

8. System nach Anspruch 7, ferner umfassend ein Mittel zum Bestimmen eines Hörpositions-Schnittstellen-Entzerrungsfilters (Hörer(f)) für eine spezielle Hörposition in dem Klangfeld durch:

Berechnen eines mechanischen Strahlungswiderstands im Nahbereichsfeld der Messtonquelle (14) auf der Grundlage von gemessenen Schalldrücken an zwei Positionen (12, 13) im Nahbereichsfeld der Messtonquelle (14), die an einer speziellen Hörposition in der Umfassung angeordnet sind; und
Bestimmen des Hörpositions-Schnittstellen-Entzerrungsfilters als die Quadratwurzel eines Verhältnisses zwischen dem mechanischen Strahlungswiderstand, bestimmt an einer Referenz-Hörposition, und
dem mechanischen Strahlungswiderstand, bestimmt an der speziellen Hörposition; und
wobei das Mittel zum Bestimmen des Entzerrungsfilters dafür eingerichtet ist, den Entzerrungsfilter als das Produkt aus dem Lautsprecher-Entzerrungsfilter (Lautsprecher(f)) und dem Hörpositions-Schnittstellen-Entzerrungsfilter (Hörer(f)) zu bestimmen.

9. System nach Anspruch 7 oder 8, ferner umfassend ein Mittel zum Speichern des Lautsprecher-Entzerrungsfilters, Lautsprecher(f), und gegebenenfalls des Hörpositions-Schnittstellen-Entzerrungsfilters, Hörer(f), entsprechend verschiedenen Bedingungen der Umfassung (1) oder ein Mittel zum Speichern jener Größen, die aus Messungen der Schalldrücke in der Umfassung abgeleitet werden und die zum Bestimmen des Lautsprecher-Entzerrungsfilters, Lautsprecher(f), und eines Hörpositions-Schnittstellen-Entzerrungsfilters, Hörer(f), verwendet werden.

10. System nach Anspruch 9, ferner umfassend eine Gruppe von Mikrofonen, welche Echtzeitmessungen des Schalldrucks während der Verwendung der Umfassung durchführen können und diese Messungen zusammen mit geeignet gespeicherten Größen verwenden können, um Echtzeitveränderungen von Eigenschaften des Entzerrungsfilters oder des Lautsprecher-Entzerrungsfilters, Lautsprecher(f), oder gegebenenfalls eines Hörpositions-Schnittstellen-Entzerrungsfilters, Hörer(f), zu bestimmen.

11. System nach Anspruch 9 oder 10, ferner umfassend ein Mittel zum Auslösen der Echtzeitveränderungen von Entzerrungsfiltereigenschaften, zum Beispiel wenn sich die akustischen Eigenschaften der Umfassung ändern oder

wenn sich die akustischen Eigenschaften der Lautsprecher (2, 3, 4) ändern, welche das Klangfeld (10) in der Umfassung (1) erzeugen.

**12.** System nach Anspruch 11, wobei das Auslösen manuell durch einen Operator durchgeführt wird, z.B. durch den Fahrer oder einen Passagier in einem Automobil.

**13.** System nach Anspruch 11, wobei das Auslösen automatisch durchgeführt wird, zum Beispiel durch Öffnen eines Fensters in einem Automobil oder wenn sich die Anzahl der Personen in der kabine ändert.

**14.** System nach einem der Ansprüche 7 bis 13, wobei die Umfassung die Kabine eines Fahrzeugs, z.B. eines Automobils, ist.

**15.** Verwendung des Systems nach einem der Ansprüche 7 bis 14 zum Realisieren des Verfahrens nach einem der Ansprüche 1 bis 6.

**Revendications**

**1.** Dispositif de détermination d'un filtre d'égalisation pour un ou plusieurs haut-parleurs fournis dans une enceinte, comme une salle d'écoute ou une cabine automobile, le procédé comprenant les étapes de :

(i) la fourniture d'un signal d'entrée audio (5) aux dits un ou plusieurs haut-parleurs (2, 3, 4) de manière à générer un champ de son (10) dans l'enceinte (1), et la détermination d'une pression de son de puissance moyenne émise à partir de l'un ou plusieurs haut-parleurs (2, 3, 4) dans ladite enceinte (1) en calculant la moyenne de puissance d'un nombre de pressions de son mesurées à un premier ensemble de positions (9) dans l'enceinte (1) ;
(ii) la détermination d'un gain de salle, RG(f), de l'enceinte (1) par

- le placement d'une source de son de mesure (14) à une position de mesure dans ladite enceinte (1) ;
- la détermination d'une pression de son de puissance moyenne émise par ladite source de son de mesure (14) dans ladite enceinte par le calcul de la moyenne de puissance d'un nombre de pressions de son mesurées à un deuxième ensemble de positions (11) ;
- la mesure de pressions de son $p_1$ et $p_2$ respectivement à deux positions (12) et (13) respectivement dans le champ proche de la source de son de mesure (14) ;
- sur la base des pressions de son mesurées aux dites deux positions (12, 13), le calcul d'une résistance de rayonnement mécanique dans le champ proche de la source de son de mesure (14) ;
- sur la base de ladite résistance de rayonnement mécanique, le calcul de la sortie de puissance acoustique de la source de son de mesure (14) ; et
- le calcul dudit gain de salle, RG(f), de l'enceinte (1) dans le champ de son généré (10) en tant que rapport entre le carré de la pression de son de puissance moyenne émise par la source de son de mesure (14) et ladite sortie de puissance acoustique de la source de son de mesure (14) ;

(iii) la formation d'un filtre d'égalisation de haut-parleurs (Speaker(f)) en tant que racine carrée d'un rapport entre une sortie de puissance acoustique cible et la sortie de puissance acoustique réelle du ou des pilotes de haut-parleurs, ladite sortie de puissance acoustique réelle étant calculée en tant que carré de la pression de son de puissance moyenne divisé par le gain de salle, RG(f) ;
(iv) la détermination dudit filtre d'égalisation en tant que ledit filtre d'égalisation de haut-parleurs (Speaker(f)).

**2.** Procédé selon la revendication 1, comprenant en outre :

- la détermination d'un filtre d'égalisation d'interface de position d'écoute (Listener(f)) pour une position d'écoute spécifique dans le champ de son par :

le placement d'une source de son mesure (14) à cette position d'écoute spécifique dans ladite enceinte, et la mesure de pressions de son $p_1$ et $p_2$ respectivement à deux positions (12) et (13) respectivement dans le champ proche de la source de son de mesure (14),
sur la base des pressions de son mesurées aux dites deux positions (12, 13), le calcul d'une résistance de rayonnement mécanique dans le champ proche de la source de son de mesure (14) ;

la détermination du filtre d'égalisation d'interface de position d'écoute en tant que racine carrée d'un rapport entre la résistance de rayonnement mécanique déterminée à une position d'écoute de référence et la résistance de rayonnement mécanique déterminée à ladite position d'écoute spécifique ; et

- la détermination dudit filtre d'égalisation en tant que produit dudit filtre d'égalisation de haut-parleurs (Speaker(f)) et dudit filtre d'égalisation d'interface de position d'écoute (Listener(f)).

3. Procédé selon la revendication 2, dans lequel ladite position d'écoute de référence est une position dans un champ libre.

4. Procédé selon l'une quelconque des revendications précédentes, comprenant les étapes de :

(i) au cours d'une phase initiale ou d'étalonnage, la mesure dudit gain de salle RG(f) et facultativement le filtre d'égalisation de l'interface de position d'écoute pour différentes conditions de ladite enceinte et la mémorisation des résultats de mesure dans un moyen de mémorisation ;
(ii) au cours de ladite phase initiale ou d'étalonnage, la détermination de ladite moyenne de puissance de pressions de son mesurées pour une ou plusieurs desdites conditions différentes de ladite enceinte et la mémorisation des résultats de mesure dans le moyen de mémorisation ; ou
au cours de ladite phase initiale ou d'étalonnage, la détermination de ladite moyenne de puissance de pressions de son mesurées pour une condition, comme une condition de référence, de ladite enceinte, et la mémorisation du résultat de mesure dans le moyen de mémorisation et, au cours de l'utilisation réelle des haut-parleurs (2, 3, 4) dans l'enceinte, l'exécution de mesures desdites pressions de son pour mettre à jour les pressions de son de puissance moyenne, afin d'effectuer de ce fait la mise à jour de caractéristiques dudit filtre d'égalisation pour correspondre à des conditions changées de l'enceinte.

5. Procédé selon la revendication 4, dans lequel le nombre $N_u$ de positions de mesure utilisées pour la mise à jour en temps réel des caractéristiques de filtre est inférieur au nombre correspondant N de positions de mesure utilisées dans la phase initiale ou d'étalonnage.

6. Procédé selon la revendication 5, dans lequel $N_u$ est égal à 3.

7. Système de détermination d'un filtre d'égalisation pour un ou plusieurs haut-parleurs fournis dans une enceinte, comme une salle d'écoute ou une cabine automobile, le système comprenant :

(a) un ou plusieurs microphones pour mesurer une pression de son à un premier ensemble de positions (9) et un deuxième ensemble de positions (11) dans un champ de son (10) dans l'enceinte ;
(b) une source de son de mesure (14) qui peut être placée à des positions choisies dans ledit champ de son (10) dans ladite enceinte (1) ;
(c) un moyen pour déterminer une pression de son de puissance moyenne émise à partir de l'un ou plusieurs haut-parleurs (2, 3, 4) dans ladite enceinte (1) en calculant la moyenne de puissance d'un nombre de pressions de son mesurées au dit premier ensemble de positions (9) ;
(d) un moyen pour déterminer un gain de salle, RG(f), de l'enceinte (1) par:

la détermination d'une pression de son de puissance moyenne émise par ladite source de son de mesure (14) dans ladite enceinte par le calcul de la moyenne de puissance d'un nombre de pressions de son mesurées au dit deuxième ensemble de positions (11) ;
le calcul d'une résistance de rayonnement mécanique dans le champ proche de la source de son de mesure (14) sur la base de pressions de son mesurées $p_1$ et $p_2$ à deux positions (12, 13) dans le champ proche de la source de son de mesure (14) ;
le calcul de la sortie de puissance acoustique de la source de son de mesure (14) sur la base de ladite résistance de rayonnement mécanique ; et
le calcul dudit gain de salle, RG(f), de l'enceinte (1) dans le champ de son généré (10) en tant que rapport entre le carré de la pression de son de puissance moyenne émise par la source de son de mesure (14) et ladite sortie de puissance acoustique de la source de son de mesure (14) ;

(e) un moyen pour former un filtre d'égalisation de haut-parleurs (Speaker(f)) en tant que racine carrée d'un rapport entre une sortie de puissance acoustique cible et la sortie de puissance acoustique réelle du ou des pilotes de haut-parleurs, ladite sortie de puissance acoustique réelle étant calculée en tant que carré de la

pression de son de puissance moyenne divisé par le gain de salle, RG(f) ;
(f) un moyen pour déterminer ladite caractéristique de filtre d'égalisation en tant que ledit filtre d'égalisation de haut-parleurs (Speaker(f)).

**8.** Système selon la revendication 1, comprenant un moyen pour déterminer un filtre d'égalisation d'interface de position d'écoute (Listener(f)) pour une position d'écoute spécifique dans le champ de son par :

le calcul d'une résistance de rayonnement mécanique dans le champ proche de la source de son de mesure (14) sur la base des pressions de son mesurées aux dites deux positions (12, 13) dans le champ proche de la source de son de mesure (14) placée à une position d'écoute spécifique dans ladite enceinte, et
la détermination du filtre d'égalisation d'interface de position d'écoute en tant que racine carrée d'un rapport entre la résistance de rayonnement mécanique déterminée à une position d'écoute de référence et la résistance de rayonnement mécanique déterminée à ladite position d'écoute spécifique ; et
dans lequel ledit moyen pour déterminer ledit filtre d'égalisation est agencé pour déterminer ledit filtre d'égalisation en tant que produit dudit filtre d'égalisation de haut-parleurs (Speaker(f)) et dudit filtre d'égalisation d'interface de position d'écoute (Listener(f)).

**9.** Système selon la revendication 7 ou 8, comprenant en outre un moyen pour mémoriser ledit filtre d'égalisation de haut-parleurs, Speaker(f), et facultativement ledit filtre d'égalisation d'interface de position d'écoute, Listener(f) correspondant à différentes conditions de ladite enceinte (1), ou un moyen pour mémoriser ces quantités qui sont dérivées de mesures desdites pressions de son dans l'enceinte et qui sont utilisées pour déterminer le filtre d'égalisation de haut-parleurs, Speaker(f), et un filtre d'égalisation d'interface de position d'écoute, Listener(f).

**10.** Système selon la revendication 9, comprenant en outre un ensemble de microphones qui peuvent effectuer des mesures en temps réel de pressions de son au cours d'une utilisation de l'enceinte et utiliser ces mesures avec des quantités mémorisées de manière appropriée pour déterminer des changements en temps réel de caractéristiques dudit filtre d'égalisation ou dudit filtre d'égalisation de haut-parleurs, Speaker(f), et facultativement un filtre d'égalisation d'interface de position d'écoute, Listener(f).

**11.** Système selon la revendication 9 ou 10, comprenant en outre un moyen pour déclencher lesdits changements en temps réel de caractéristiques de filtre d'égalisation, par exemple lorsque les propriétés acoustiques de l'enceinte changent, ou lorsque les propriétés acoustiques des haut-parleurs (2, 3, 4) qui créent le champ acoustique (10) dans l'enceinte (1) changent.

**12.** Système selon la revendication 11, dans lequel ledit déclenchement est effectué manuellement par un opérateur, comme par le conducteur ou un passager d'une voiture.

**13.** Système selon la revendication 11, dans lequel ledit déclenchement est effectué automatiquement, par exemple en ouvrant une vitre d'une voiture ou lorsque le nombre de personnes dans la cabine est changé.

**14.** Système selon l'une quelconque des revendications 7 à 13, dans lequel ladite enceinte est la cabine d'un véhicule, comme une voiture.

**15.** Utilisation du système selon l'une quelconque des revendications 7 à 14 pour mettre en oeuvre le procédé selon l'une quelconque des revendications 1 à 6.

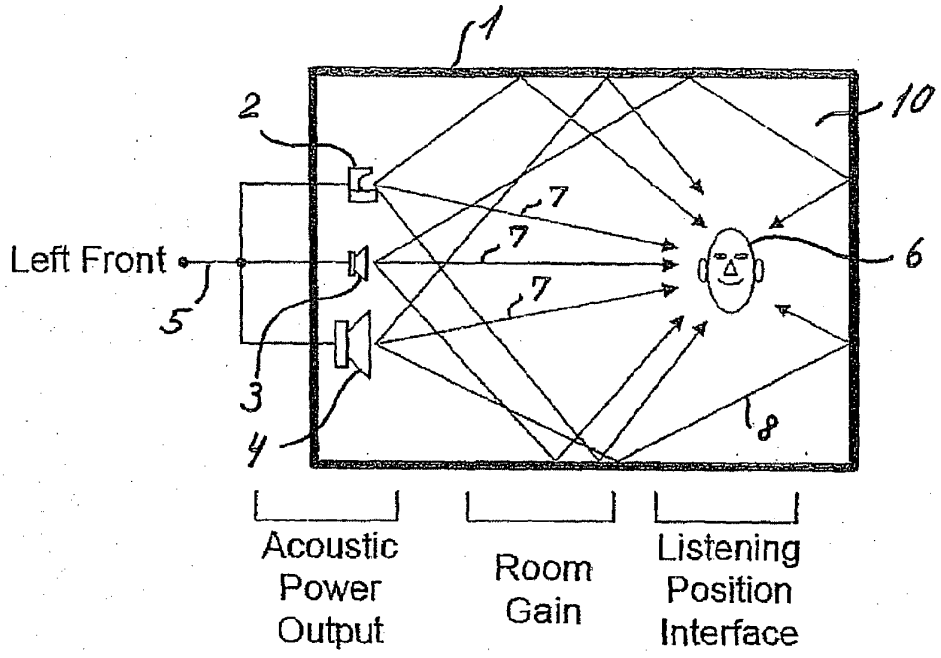

1
2
10
Left Front
5
7
7
7
6
3
4
8
Acoustic Power Output
Room Gain
Listening Position Interface

Fig. 1

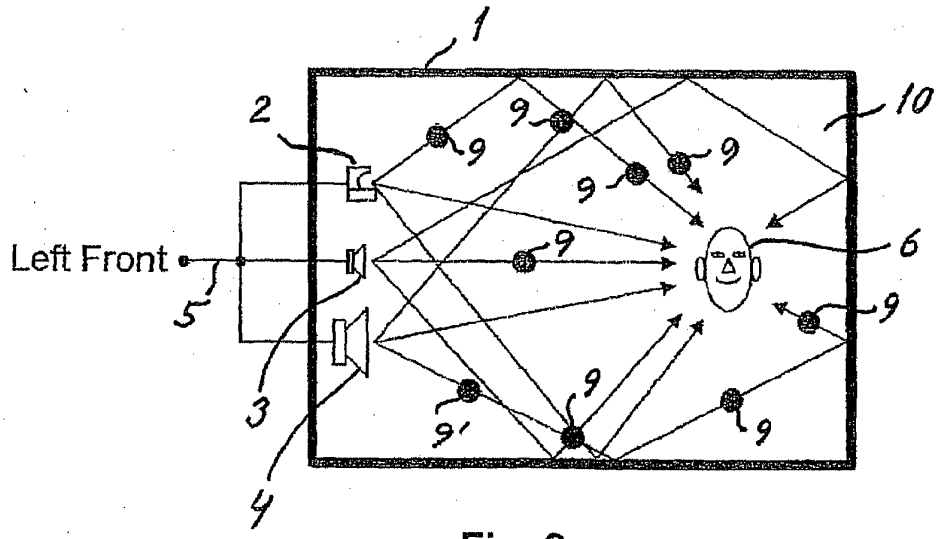

1
2
9
9
9
9
9
10
Left Front
5
9
6
9
3
9'
9
9
4

Fig. 2

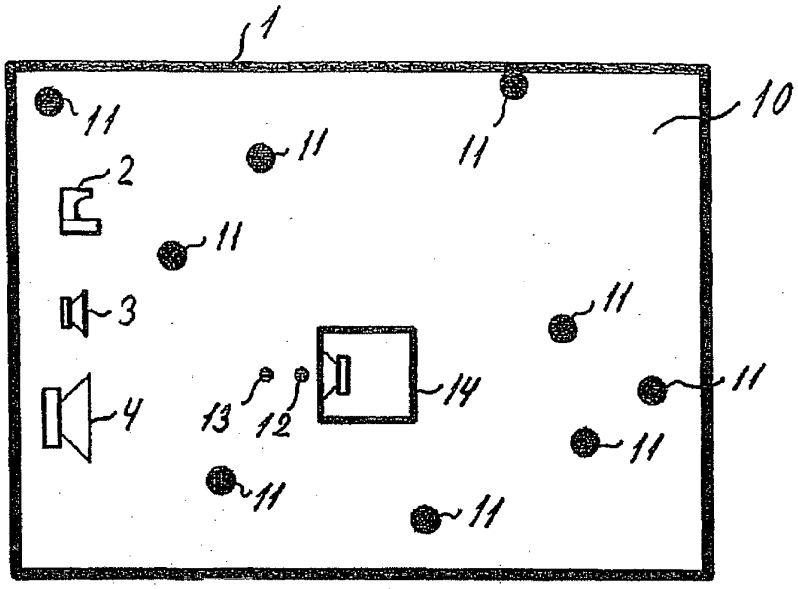



Fig. 3

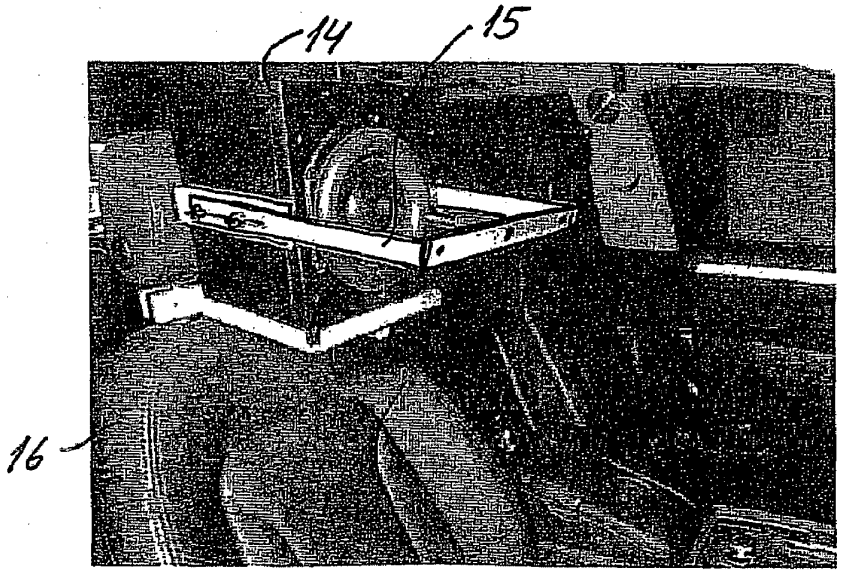



Fig. 4

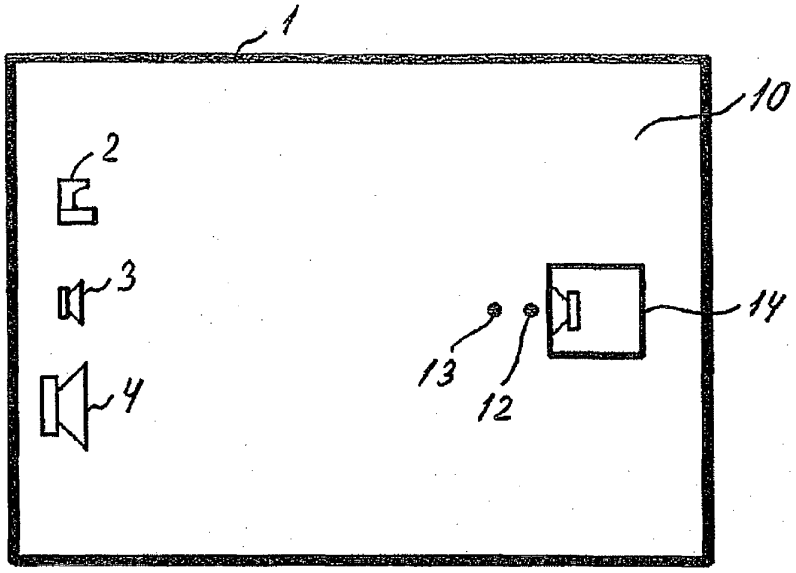



Fig. 5

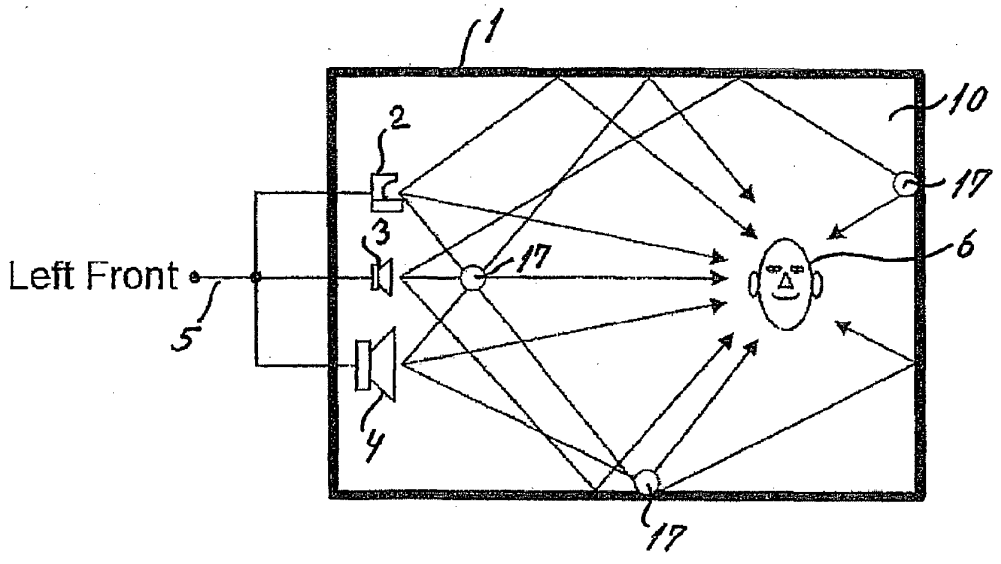



Fig. 6

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***H04L 29/06*** (2006.01) ***H04N 21/8547*** (2011.01)

(56) Documents Cited:
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**US 20070058762 A1** **US 20050259754 A1**
**US 20040228367 A1**

(58) Field of Search:
INT CL **H04L, H04N**
Other: **EPODOC, WPI.**

(54) Title of the Invention: **Media distribution system**
Abstract Title: **Time stamps are added to data transmitted via Bluetooth® connections to facilitate synchronised output of the data from a plurality of devices.**

(57) A system and method for transmitting data to a plurality of output devices 401, 402 comprises: associating timing data with first and second frames of data representing media where the timing data indicates when the media should be output; the establishment first and second Bluetooth® connections 412, 413 to first and second output devices respectively; the transmission of the first and second frames of data to first and second output devices respectively; and outputting the media at a time indicated by the timing data. The media may be audio and the data encoded audio where first and second frames of data are respectively left and right channels of an audio signal. The output devices may comprise speakers 426, 427. The system may further comprise a third frame of data, Bluetooth® connection and device wherein the frames of data represent channels of a surround sound system.

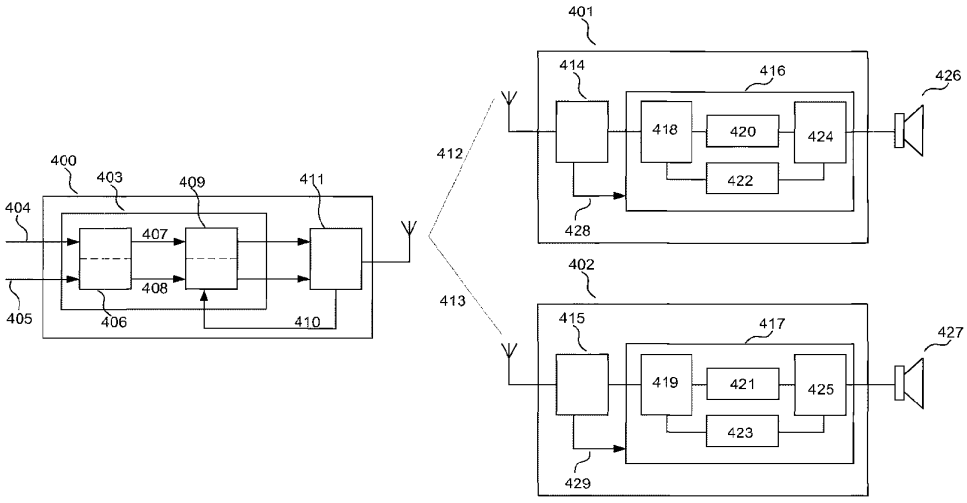



Figure 4

GB 2486183 A

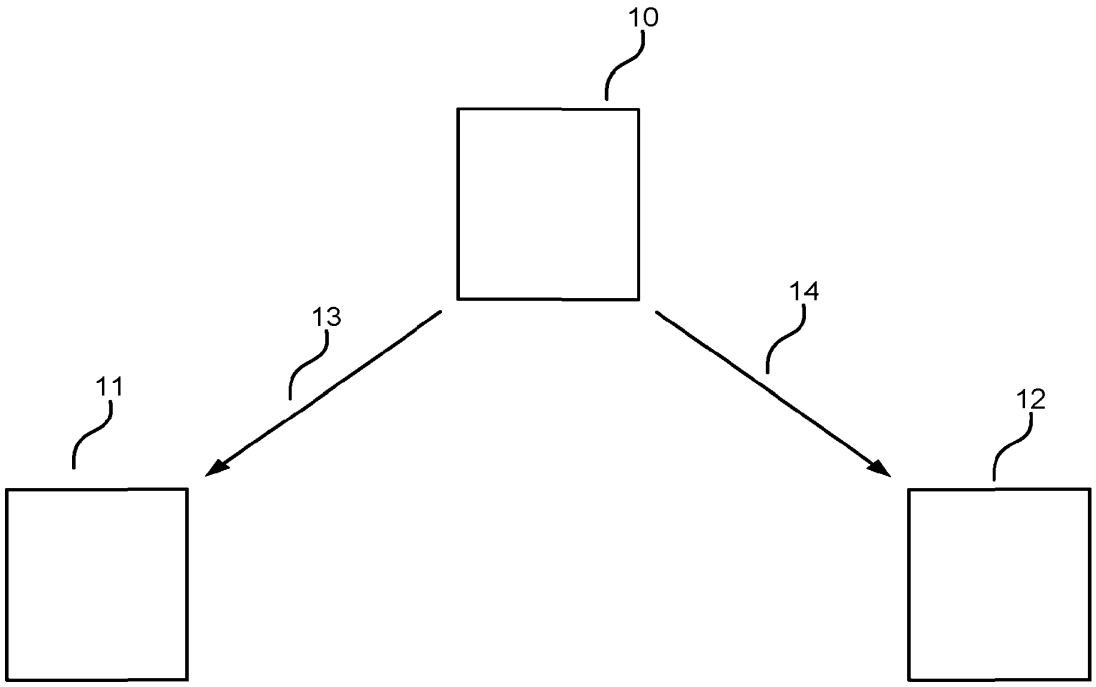



Figure 1

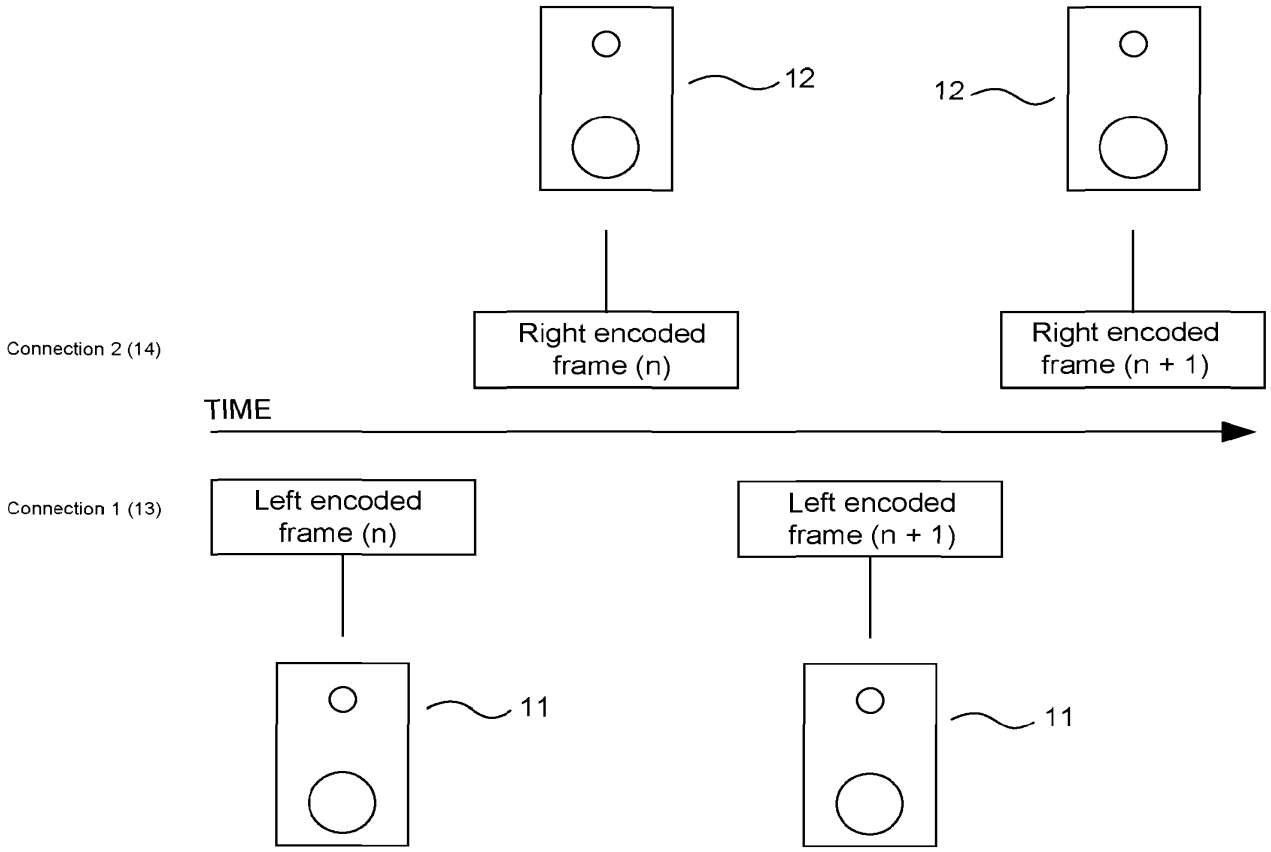

12
12
Connection 2 (14)
Right encoded frame (n)
Right encoded frame (n + 1)
TIME
Connection 1 (13)
Left encoded frame (n)
Left encoded frame (n + 1)
11
11

Figure 2

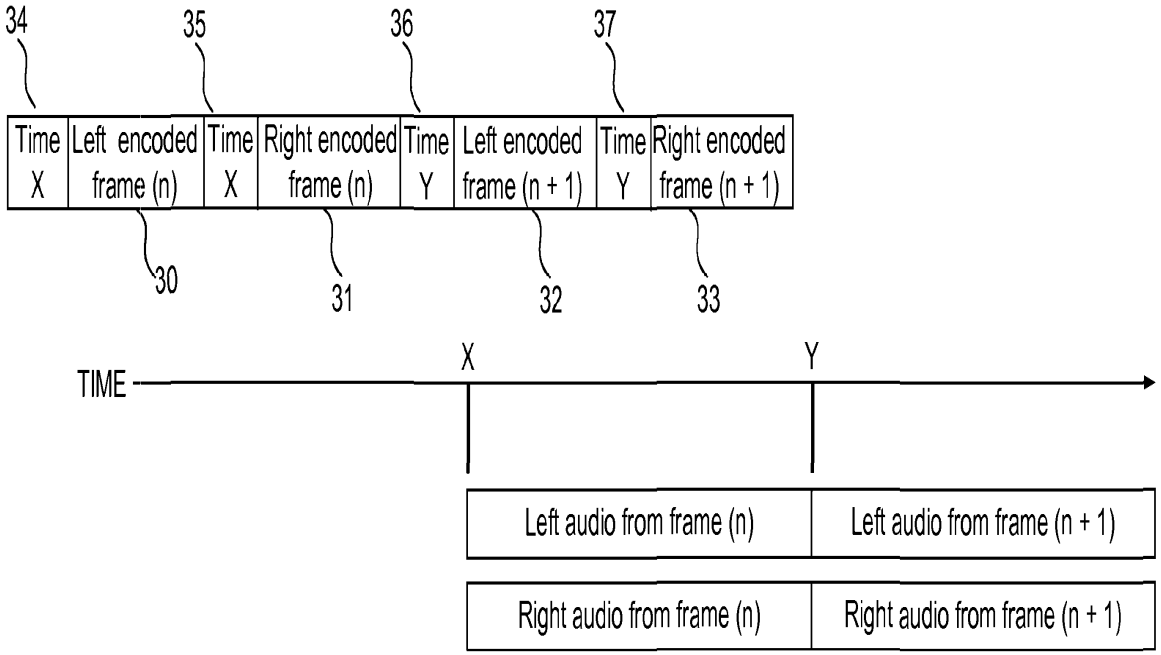

34
35
36
37
Time X
Left encoded frame (n)
Time X
Right encoded frame (n)
Time Y
Left encoded frame (n + 1)
Time Y
Right encoded frame (n + 1)
30
31
32
33
TIME
X
Y
Left audio from frame (n)
Left audio from frame (n + 1)
Right audio from frame (n)
Right audio from frame (n + 1)

Figure 3

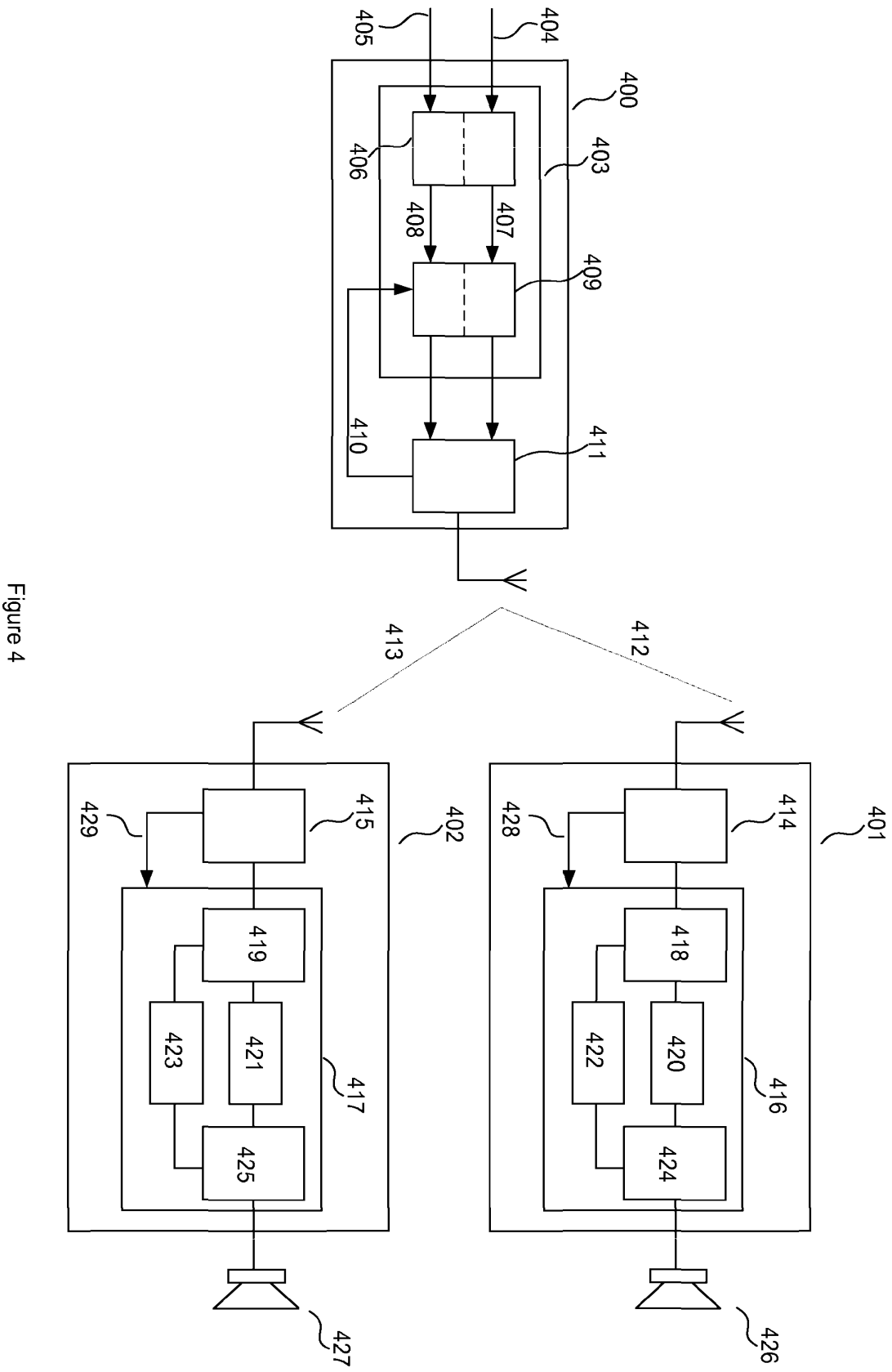

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Figure 4

The following terms are registered trademarks and should be read as such wherever they occur in this document:

Bluetooth
Dolby

# MEDIA DISTRIBUTION SYSTEM

## BACKGROUND

[0001] Apparatus and methods for synchronising data transmitted over wireless connections, and in particular Bluetooth® connections, are disclosed.

[0002] Bluetooth® is a very widely adopted protocol for enabling wireless connections between devices. The Bluetooth® protocol is a point-to-point protocol in which two devices interact to exchange data. If a single device requires connections to two other devices, independent connections are configured for each other device. Those connections are not synchronised with each other, and may have different sample rates, data rates, and formats, as configured by the two devices. The lack of synchronisation may prevent the use of the Bluetooth® protocol where there is a need for synchronisation between data received at the two devices.

[0003] Figure 1 shows an example in which a source device 10 is connected wirelessly to a left 11 and a right 12 speaker forming a stereo pair. The output of each speaker must be aligned in time to ensure the audio is correctly replicated for the listener. Any misalignment will result in a decrease in the quality of the audio. The two speakers 11, 12 can be connected to the source device by two Bluetooth® connections 13, 14. When data is transmitted on both of these connections the frames of audio for each speaker are formed into packets for the Bluetooth® connection, which packets are interleaved on the radio link for delivery to each speaker, as per the Bluetooth® protocol and shown in Figure 2.

[0004] There is therefore a difference in the time at which the Left and Right speakers 11,12 receive the data, resulting in a delay and misalignment in the audio output. If the left speaker 11 is made aware that there is another speaker in the system, it can delay its output to account for the delay in arrival of the data at that other speaker. However, this does not provide for a robust or accurate system as the delay associated with each speaker is not known accurately, and the delay may vary dependent on the amount of data held in the buffer of each speaker. It is not therefore possible to reliably align the audio output of two speakers connected using two Bluetooth® connections.

[0005] In many applications, low-latency is an important characteristic of a wireless connection. For example in telecommunication applications low latency is vital in achieving good quality telephone connections. Low-latency is also important where an audio output must be synchronised with other outputs, for example television pictures, or pictures from a computer game.

[0006] Specific protocols for providing low-latency, or synchronised links, have been proposed, but there is a requirement for a synchronised and low-latency wireless system. In particular there is a requirement for a system to provide Bluetooth® wireless connections with these properties.

**SUMMARY**

[0007] The following presents a simplified summary of the disclosure in order to provide a basic understanding to the reader. This summary is not an extensive overview of the disclosure and it does not identify key/critical elements of the invention or delineate the scope of the invention. Its sole purpose is to present some concepts disclosed herein in a simplified form as a prelude to the more detailed description that is presented later.

There is provided a method of synchronising the output of media by a plurality of output devices, the method comprising the steps of associating timing data representing a time with a first frame of data representing media for output by a first output device, associating timing data representing the time with a second frame of data representing media for output by a second output device, and transmitting the first frame and the associated timing data to the first output device via a first Bluetooth connection, and transmitting the second frame and the associated timing data to the second output device via a second Bluetooth connection.

The method may further comprise the step of, at the represented time, outputting media represented by the first frame from the first output device, and outputting media represented by the second frame from the second output device.

The media may be audio.

The frames of data may be frames of encoded audio data.

The time may be indicated with respect to a common clock of the Bluetooth links.

The method may further comprise the steps of encoding the left channel of an audio signal as the first frame of data, and encoding the right channel of an audio signal as the second frame of data, wherein the first output device is a left speaker, and the second output device is a right speaker.

The steps may be repeated a plurality of times for a sequence of first and second frames, wherein the time associated with each pair of first and second frames is advanced compared to the previous pair of first and second frames.

The time associated with the first and second frames may represent a time at which the first and second output devices are expected to be able to output the media represented by those frames.

The method may further comprise the steps of associating timing data representing the time with a third frame of data representing media for output by a third output device, transmitting the third frame and the associated timing data to the third output device via a third Bluetooth connection.

The method may further comprise the step of outputting media represented by the third frame from the third output device.

The frames of data may represent channels of audio in a surround sound system, and the output devices are speakers configured to output the represented channels of audio.

The timing data may be associated with the first and/or second frame of data representing media by encoding the timing data together with the audio data.

The timing data may be associated with the first, second and/or third frame of data by appending the timing information to that frame of data

The method may further comprise the step of transmitting frames of data representing media for output by the first and/or second output device, wherein those frames of data are not associated with timing information.

There is also provided a source device for transmitting data to a plurality of output devices, comprising a processing system configured to associate timing data with first and second frames of data representing media, the timing data indicating a time at which the media represented by the first and second frames of data should be output; a Bluetooth system configured to establish a first Bluetooth connection with a first output device, and a second Bluetooth connection with a second output device, and to transmit the first frame of data and associated time stamp to the first output device, and to transmit the second frame of data and associated time stamp to the second output device.

The processing system may be further configured to encode the left channel of an audio signal as the first frame of data, and encode the right channel of an audio signal as the second frame of data.

The processing system may be further configured to associate timing data indicated the time with a third frame of data representing media, and the Bluetooth system is configured to establish a third Bluetooth connection with the third output device and to transmit the third frame of data represented media to the third output device.

There is also provided a media output device, comprising a Bluetooth system for establishing and maintaining a connection to a source device, and a processing system configured for receiving data representing media for output by the output device from the Bluetooth connection, and outputting the media at a time indicated by a time stamp associated and received with that data.

There is also provided a method of outputting media in synchronisation with the output of media from other, unconnected, devices, the method comprising the steps of receiving via a Bluetooth connection data representing the media and data indicating a time which the media should be output, and outputting the media at the indicated time.

[0008] Many of the attendant features will be more readily appreciated as the same becomes better understood by reference to the following detailed description considered in connection with the accompanying drawings.

DESCRIPTION OF THE DRAWINGS

[0009] The present description will be better understood from the following detailed description read in light of the accompanying drawings, wherein:

Figure 1 shows a schematic diagram of a source device and two output devices;

Figure 2 shows a representation of the transmission of data via two Bluetooth connections;

Figure 3 shows a representation of the transmission of data to synchronise outputs; and

Figure 4 shows a system for transmitting and outputting synchronised media.

DETAILED DESCRIPTION

[0010] The detailed description provided below in connection with the appended drawings is intended as a description of the present examples and is not intended to represent the only forms in which the present example may be constructed or utilized. The description sets forth the functions of the example and the sequence of steps for constructing and operating the example. However, the same or equivalent functions and sequences may be accomplished by different examples.

[0011] Figure 3 shows a schematic diagram of data transmission over the Bluetooth® connections described in relation to Figure 1 to provide a synchronised, low-latency, distribution of data from source device 10 to speakers 11, 12. Source device 10 is configured to encode left and right audio signals into frames 30, 31, 32, 33 for transmission to speakers 11, 12. The frames 30, 32 for the left speaker 11 are transmitted over the first Bluetooth connection 13, and the frames 31, 33 for the right speaker 12 are transmitted over the second Bluetooth connection 14.

[0012] For clarity of explanation, in this example it is assumed that the encoded frame and timing information (described below) fits into a single packet such that frames and timing data are not split between packets. In accordance with the Bluetooth® protocol packets are transmitted over the first and second Bluetooth® links alternately, and thus as shown in Figure 3 frames for the left and right speakers are transmitted alternately.

[0013] The source device 10 associates a time stamp 34, 35, 36, 37 with each encoded frame 30, 31, 32, 33 indicating the time at which the audio represented by that frame should be output by the receiving speaker. Since frames 30, 31 represent left and right audio for output at the same time, the same time stamp is associated with both frames. The time is described with reference to the Bluetooth clock that is distributed via the Bluetooth connections from the source device to the output devices.

[0014] The time indicated for each frame is selected such that both the left and right speakers will have received, and can output, the relevant frame at the indicated time.

[0015] In Figure 3, the left and right frames 30, 31 are marked for output at time X, which in this example coincides with the end of frame 31. At time X each of the speakers commence output of the audio represented by frame n. The time is indicated with reference to the Bluetooth clock distributed to each of the devices from the source device, and therefore the output from each device commences at the same time. The audio output of the left and right speakers is thus synchronised, despite the Bluetooth connections themselves being unsynchronised. As seen in Figure 3, while frames 30, 31 are being output, frames 32, 33 are being received ready for output at time Y, which falls at the end of the output of frame 33. A continuous, synchronised, audio output is thus achieved.

[0016] No modification of the Bluetooth system is required as the protocols and data formats are unchanged, the time stamp is simply transmitted as regular payload data along with the encoded audio frame.

[0017] The use of an absolute time stamp enables the speakers to recover synchronisation even if their buffers become completely empty and output stops. Output can be recommenced at any time once a frame and time stamp are successfully received. As performed in existing systems resampling and resynthesis of frames held in the buffer may be utilised to re-fill the buffer after errors in the communications link.

[0018] A small latency is introduced into the system due to the speaker receiving frames first waiting for the second speaker to receive the same frame. Frames 30, 31 are not therefore output instantly, but there is a delay to time X. This delay is dependent on, amongst other parameters, the frame size, and is generally small compared to acceptable latency times. The latency of the system may be varied depending on the configuration.

[0019] Typically output devices will include a buffer for storing frames before they are output, such that errors in frames can be accommodated by waiting for retransmission while playing data from the buffer. The use of a buffer increases latency, but also increases robustness. When a buffer is utilised the time for frames to pass through the buffer is accommodated by the time stamp being set to a suitable value. For example, in an MP3 playback system a highly robust, but higher latency system, may be provided by utilising a large buffer size. For television playback, a lower latency system may be utilised by reducing packet, frame, and buffer sizes, which may also lead to a reduction in robustness. Selection of appropriate frame and packet sizes enables efficient use of the wireless connection. For example, very small frame sizes may be utilised to minimise the proportion of frames split between packets.

[0020] Figure 4 shows a schematic diagram of a system for implementing the above method for transmitting synchronised audio data from source device 400 to two speakers 401, 402. The source device 400 comprises a processing system 403. Processing system 403 receives Left 404 and Right 405 audio data and comprises a coder 406 for coding that audio data into two coded data streams 407, 408. For example, the coder may code the audio into the SBC or MP3 formats, comprising frames of data. In alternative embodiments the audio signals may be pre-coded, or coded by a separate system, in which case processing system 403 would not provide this coding function.

[0021] Processing block 409 associates each frame of the coded data 407, 408 with a time stamp indicating the time at which the audio represented by that frame of data should be output. The time stamp is defined with respect to a Bluetooth® clock 410, which is also distributed to devices connected to the source device 400 via Bluetooth® connections maintained by Bluetooth® system 411.

[0022] As explained hereinbefore the time stamp indicates a future time at which all output devices will be in receipt of the data frame and able to output the audio represented by that frame.

[0023] Bluetooth® system 411 acts as a master and maintains two Bluetooth® connections 412, 413, one to each of the output speakers 401, 402. The Bluetooth® systems 414, 415 of the speakers are slaves in the Bluetooth® connections to the source device 400.

[0024] Bluetooth® system 411 receives the coded audio data with the applied time stamps from processing block 409 and transmits the data corresponding to the left audio channel to the left speaker 401 via Bluetooth® connection 412, and the data corresponding to the right audio channel to the right speaker 402 via Bluetooth® connection 413.

[0025] Bluetooth® systems 414, 415 receive the respective data from the source device 400, and communicate it to processing systems 416, 417. Processing blocks 418, 419 separate the time information from the encoded audio frames. The audio frames are stored in frame buffers 420, 421, and the timing information is stored in timing buffers 422, 423. The buffers are configured such that the relation between the time information and audio frames is maintained.

[0026] Decoders 424, 425 receive frames from the frame buffers 422, 423, decode the data, and output a signal to speakers 426, 427 representing the audio. Decoders 424, 425 also receive the timing information from timing buffers 422, 423, and the Bluetooth® clock 428, 429, and output the signals at the time indicated by that information. Since both speakers 401, 402 receive clock information from the source device 400, which has used that clock information to define the timing information associated with each frame, the output of each speaker is synchronised at the desired output time.

[0027] The blocks and division of functions shown in Figure 4 is for clarity only, and other divisions or processing steps are possible to provide the same functionality as that provided by Figure 4. For example, the decoding stage may be performed before the buffer stage, such that any variation in the time taken to decode the frames does not affect the output time. The time indicated by the source device may therefore be utilised as an indication of any particular step in the decoding and output process, provided each device relates the time to the same step.

[0028] The output from the decoder may be communicated to an internal or external speaker as appropriate for the particular device.

[0029] The above examples have been given by way of reference to a source device distributing data to a stereo pair of speakers. As will be appreciated, this example is not restrictive and the principles described hereinbefore may be utilised in a range of systems. For example, the output devices may be audio-visual output devices in which case the system can be utilised to synchronise a stereo audio output with a visual display. Similarly, the number of output devices may be varied for the particular system. For example the system may be utilised to distribute audio to a system of surround sound speakers comprising 5 or more speakers. For example, a surround sound system offering Dolby 5.1 sound may be connected using Bluetooth® links thereby avoiding physical connections between the speakers and source device. Such a system operates as described hereinbefore, but a Bluetooth connection is utilised between the source and each speaker, with the packets for each connection being interleaved.

[0030] In the above embodiments a time stamp is included in every frame, but in alternative embodiments a time-stamp may be included in only some of the frames. For example, in every $5^{th}$, $10^{th}$, or $n^{th}$ frame. Such a system reduces the data overhead required for transmission of the timing information. In between the frames with the time stamp, the output device is left to free-run based on its internal clock. An indicator is provided to indicate which frames comprise timing information. The frames with which timing information is included may be selected on a dynamic basis based on performance of the connection.

[0031] The interval between frames with time stamps may be selected based on a worst-case estimation of possible changes in processing time at the output device (for example changes in buffer size or processing delay) compared to acceptable drift between the output devices. This ensures that an unacceptable variation between output devices will not occur in the time period between time stamps. The output devices may also be configured to monitor their delay and if there is a significant change to resample the available samples or stop output until the next time stamp is available for output, thereby further controlling the possible variation between output devices.

[0032] Should the buffer of an output device become empty, and the device's output thereby stop, output can only be restarted once the next frame with a time stamp is received. There is therefore a trade-off between recovery time and data overhead.

[0033] In a further variation, the timing data may be added to the audio data and encoded with that audio data by the audio encoder. This scheme removes the data overhead in the encoded frames, but leads to a small increase in distortion of the audio. Consequential changes are made to the receiving system such that the signal is decoded, and the timing information extracted from the decoded data, as will be apparent to the skilled person.

[0034] The methods and systems described herein are not restricted to particular types of Bluetooth® connections, and may be implemented, for example, using SCO or A2DP connections. References to Bluetooth® are references to the Bluetooth® family of protocols in general as promoted by the Bluetooth SIG.

[0035] The term 'processing system' is used herein to refer to any device with processing capability such that it can execute instructions. Those skilled in the art will realize that such processing capabilities are incorporated into many different devices and therefore the term includes, for example, all types of micro-processors, CPUs, GPUs, and DSPs, and multifunction chips.

[0036] The methods described herein may be performed by software in machine readable form on a tangible storage medium e.g. in the form of a program comprising program code means adapted to perform all the steps of any of the methods described herein when the program is run on a processing system and where the program may be embodied on a readable medium. Examples of tangible (or non-transitory) storage media include disks, thumb drives, memory etc and do not include propagated signals. The software can be suitable for execution on a parallel

processor or a serial processor such that the method steps may be carried out in any suitable order, or simultaneously.

[0037] This acknowledges that software can be a valuable, separately tradable commodity. It is intended to encompass software, which runs on or controls "dumb" or standard hardware, to carry out the desired functions. It is also intended to encompass software which "describes" or defines the configuration of hardware, such as HDL (hardware description language) software, as is used for designing silicon chips, or for configuring universal programmable chips, to carry out desired functions.

[0038] Any range or device value given herein may be extended or altered without losing the effect sought, as will be apparent to the skilled person.

[0039] It will be understood that the benefits and advantages described above may relate to one embodiment or may relate to several embodiments. The embodiments are not limited to those that solve any or all of the stated problems or those that have any or all of the stated benefits and advantages. It will further be understood that reference to 'an' item refers to one or more of those items. Features of each embodiment may be considered in any functioning combination.

[0040] The steps of the methods described herein may be carried out in any suitable order, or simultaneously where appropriate. Additionally, individual blocks may be deleted from any of the methods without departing from the spirit and scope of the subject matter described herein. Aspects of any of the examples described above may be combined with aspects of any of the other examples described to form further examples without losing the effect sought.

[0041] The term 'comprising' is used herein to mean including the method blocks or elements identified, but that such blocks or elements do not comprise an exclusive list and a method or apparatus may contain additional blocks or elements.

[0042] It will be understood that the above description of a preferred embodiment is given by way of example only and that various modifications may be made by those skilled in the art. The above specification, examples and data provide a complete description of the structure and use of exemplary embodiments of the invention. Although various embodiments of the invention have been described above with a certain degree of particularity, or with reference to one or more individual embodiments, those skilled in the art could make numerous alterations to the disclosed embodiments without departing from the spirit or scope of this invention, including combining features disclosed in respect of one embodiment with features disclosed in respect of a second embodiment.

CLAIMS

1. A method of synchronising the output of media by a plurality of output devices, the method comprising the steps of

associating timing data representing a time with a first frame of data representing media for output by a first output device,

associating timing data representing the time with a second frame of data representing media for output by a second output device, and

transmitting the first frame and the associated timing data to the first output device via a first Bluetooth connection, and transmitting the second frame and the associated timing data to the second output device via a second Bluetooth connection.

2. A method according to claim 1, further comprising the step of, at the represented time, outputting media represented by the first frame from the first output device, and outputting media represented by the second frame from the second output device.

3. A method according to claim 1 or 2, wherein the media is audio.

4. A method according to claim 3, wherein the frames of data are frames of encoded audio data.

5. A method according to any preceding claim, wherein the time is indicated with respect to a common clock of the Bluetooth links.

6. A method according to any preceding claim, further comprising the step of encoding the left channel of an audio signal as the first frame of data, and encoding the right channel of an audio signal as the second frame of data, wherein the first output device is a left speaker, and the second output device is a right speaker.

7. A method according to claim 1, wherein the steps of claim 1 are repeated a plurality of times for a sequence of first and second frames, wherein the time associated with each pair of first and second frames is advanced compared to the previous pair of first and second frames.

8. A method according to any preceding claim, wherein the time associated with the first and second frames represents a time at which the first and second output devices are expected to be able to output the media represented by those frames.

9. A method according to claim 1, further comprising the steps of

associating timing data representing the time with a third frame of data representing media for output by a third output device,

transmitting the third frame and the associated timing data to the third output device via a third Bluetooth connection.

10. A method according to claim 9, further comprising the step of outputting media represented by the third frame from the third output device.

11. A method according to claim 9, wherein the frames of data represent channels of audio in a surround sound system, and the output devices are speakers configured to output the represented channels of audio.

12. A method according to claim 4, wherein the timing data is associated with the first and/or second frame of data representing media by encoding the timing data together with the audio data.

13. A method according to any preceding claim, wherein the timing data is associated with the first, second and/or third frame of data by appending the timing information to that frame of data

14. A method according to any preceding claim, further comprising the step of transmitting frames of data representing media for output by the first and/or second output device, wherein those frames of data are not associated with timing information.

15. A source device for transmitting data to a plurality of output devices, comprising

a processing system configured to associate timing data with first and second frames of data representing media, the timing data indicating a time at which the media represented by the first and second frames of data should be output;

a Bluetooth system configured to establish a first Bluetooth connection with a first output device, and a second Bluetooth connection with a second output device, and to transmit the first frame of data and associated time stamp to the first output device, and to transmit the second frame of data and associated time stamp to the second output device.

16. A source device according to claim 15 wherein the processing system is further configured to encode the left channel of an audio signal as the first frame of data, and encode the right channel of an audio signal as the second frame of data.

17. A source device according to claim 15, wherein the processing system is further configured to associate timing data indicated the time with a third frame of data representing media, and the Bluetooth system is configured to establish a third Bluetooth connection with the third output device and to transmit the third frame of data represented media to the third output device.

18. A media output device, comprising

a Bluetooth system for establishing and maintaining a connection to a source device, and

a processing system configured for receiving data representing media for output by the output device from the Bluetooth connection, and outputting the media at a time indicated by a time stamp associated and received with that data.

19. A method of outputting media in synchronisation with the output of media from other, unconnected, devices, the method comprising the steps of

receiving via a Bluetooth connection data representing the media and data indicating a time which the media should be output, and

outputting the media at the indicated time.

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## Patents Act 1977: Search Report under Section 17

**Documents considered to be relevant:**

| Category | Relevant to claims | Identity of document and passage or figure of particular relevance |
|---|---|---|
| X | 1 to 19 | US2008/291863 A1 (AGREN MATTIAS PER) See whole document, particularly paragraphs 0009 and 0087. |
| X | 1 to 19 | US2004/228367 A1 (MOSIG RUDIGER) See whole document, particularly paragraphs 0047 to 0049. |
| X | 18 at least | US2005/259754 A1 (HO JIN-MENG et al) See whole document, particularly paragraphs 0009 and 0028. |
| X | 1, 15 and 18 at least | US2007/058762 A1 (HUDSON MICHAEL D et al) See whole document, particularly paragraphs 0012 and 0027. |
| X | 1, 15 and 18 at least | US2007/214229 A1 (MILLINGTON NICHOLAS A J et al) See whole document, particularly paragraph 0013. |

Categories:

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| X | Document indicating lack of novelty or inventive step | A | Document indicating technological background and/or state of the art. |
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*[Continued on next page]*

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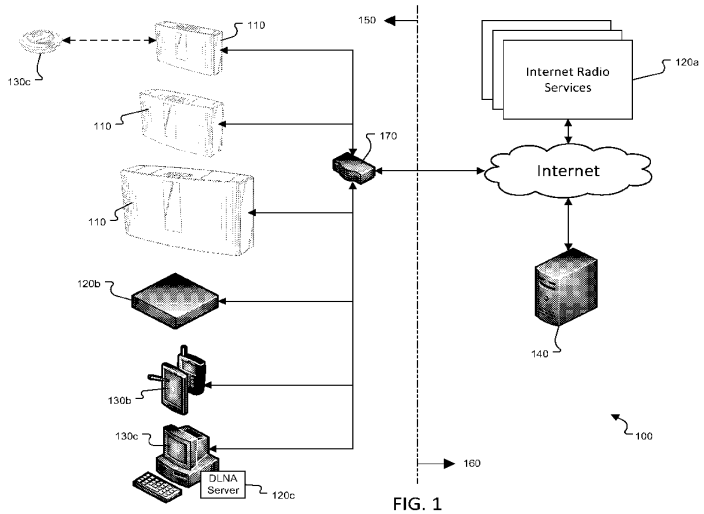



FIG. 1

(57) Abstract: A method for managing presets in an audio system is provided. The method includes syncing preset assignments on a plurality of audio playback devices such that preset assignments on any one of the audio playback devices correspond to respective preset assignments on each of the other audio playback devices, and, such that, if one of the preset assignments is changed on one of the audio playback devices, each of the other audio playback devices is automatically updated such that a corresponding change is made to a corresponding preset assignment on each of the other audio playback devices. Each of the preset assignments is an assignment of an entity associated with one of a plurality of digital audio sources to one of a plurality of preset indicators on the corresponding one of the audio playback devices.

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# AUDIO SYSTEMS AND RELATED DEVICES AND METHODS

## BACKGROUND

**[0001]** This disclosure relates to audio systems and related devices and methods, and, particularly, to managing (e.g., synchronizing) presets among devices in an audio system.

## SUMMARY

**[0002]** All examples and features mentioned below can be combined in any technically possible way.

**[0003]** In one aspect, a method for managing presets in an audio system is provided. The method includes syncing preset assignments on a plurality of audio playback devices such that preset assignments on any one of the audio playback devices correspond to respective preset assignments on each of the other audio playback devices, and, such that, if one of the preset assignments is changed on one of the audio playback devices, each of the other audio playback devices is automatically updated such that a corresponding change is made to a corresponding preset assignment on each of the other audio playback devices. Each of the preset assignments is an assignment of an entity associated with one of a plurality of digital audio sources to one of a plurality of preset indicators on the corresponding one of the audio playback devices.

**[0004]** Implementations may include one of the following features, or any combination thereof.

**[0005]** In some implementations, the step of syncing preset assignments on a plurality of audio playback devices includes receiving information from a first audio playback device of the audio system regarding a change to one or more of a plurality of preset assignments; updating stored preset data based on the information received from the first audio playback device; and providing update information to one or more other audio playback devices of

the audio system such that the one or more other audio playback devices update their respective preset assignments to correspond to those of the first audio playback device.

**[0006]** In certain implementations, the step of updating stored preset data includes updating preset data stored on a remote server.

**[0007]** In some implementations, the step of updating stored preset data includes replacing a first set of preset assignments with a second, updated set of preset assignments.

**[0008]** In certain implementations, the method also includes receiving user input regarding the assignment of an entity associated with one of the digital audio sources to one of the preset indicators on a first one of the audio playback devices.

**[0009]** In some implementations, the user input corresponds to actuation of a hardware button on a first one of the audio playback devices.

**[0010]** In certain implementations, the user input is received via a controller connected to the first one of the audio playback devices via a network connection.

**[0011]** In some implementations, the assignable entities include at least (i) user-defined playlists of digital music and (ii) Internet radio stations.

**[0012]** The digital audio sources may include a plurality of Internet radio sites, and the entities may include individual radio stations provided by the Internet radio sites.

**[0013]** In certain implementations, the preset indicators provide access to their respectively assigned entities in the same manner irrespective of the associated digital audio source.

**[0014]** In some implementations, the preset indicators provide for single press access to the respectively assigned entities, irrespective of the digital audio source.

**[0015]** In another aspect, an audio system server includes a processor, and instructions stored on a computer-readable media that. When executed, the instructions cause the processor to: receive information from a first audio playback device of an audio system regarding a change to one or more of a plurality of preset assignments; update stored preset data based on the information received from the first device; and to provide update information to one or more other audio playback devices of the audio system such that each of the one or more other audio playback devices update their respective preset assignments to correspond to those of the first audio playback device. Each of the preset assignments represents an assignment of an entity associated with one of a plurality of digital audio sources to a corresponding preset indicator.

**[0016]** Implementations may include one of the above and/or below features, or any combination thereof.

**[0017]** In some implementations, the audio system server is a cloud-based server.

**[0018]** In certain implementations, the instructions, when executed, cause the processor to provide the update information to the one or more other audio playback devices in response to communication received from the one or more other audio playback devices requesting the update information.

**[0019]** In some implementations, the update information is an updated list of preset assignments.

**[0020]** In certain implementations, the instructions, when executed, cause the processor to: maintain a global recents list. The global recents list is a list of entities that is populated from content that the user has chosen to play on one or more of the audio playback devices.

**[0021]** In some implementations, the instructions, when executed, cause the processor to: receive information from a first audio playback device of an audio system regarding selection of a first entity for providing streamed music; update stored recent data based on

the information received from the first device; and to provide updated recents information to one or more other audio playback devices of the audio system such that each of the one or more other audio playback devices updates a locally stored recents list to correspond to a recents list stored on the first audio playback device.

**[0022]** In certain implementations, the instructions, when executed, cause the processor to: receive a copy of a token from a first audio playback device of an audio system, wherein the token is a unique identifier that a corresponding one of the digital audio sources recognizes and associates with a user account, thereby to provide access to the user account; store the copy of the token within the audio system server; and to provide copies of the token other audio playback devices of the audio system such that the corresponding one of the digital audio sources can recognize the other audio playback devices as being associated with the user account.

**[0023]** A further aspect features an audio system that includes i) a plurality of audio playback devices, and ii) a remote server. Each audio playback device is configured to operatively connect to a plurality of digital audio sources for playback of content from the digital audio sources. Each of the audio playback devices includes a set of preset indicators. Each preset indicator in the set of preset indicators is configured to have assigned to it an entity associated with one of the plurality of digital audio sources. The remote server is configured to receive information from one of the audio playback devices regarding changes to preset assignments. Each of the preset assignments represents an assignment of an entity associated with one of the digital audio sources to a corresponding one of the preset indicators. The remote server is further configured to update a stored set of global preset assignments based on the information received; and to distribute update information to the other ones of the audio playback devices regarding changes to the global preset assignments. The other ones of the audio playback devices are configured to update their respective preset assignments based on the update information distributed from the remote server such that, following the update, all of the audio playback devices of the plurality of audio playback devices have the same preset assignments.

**[0024]** Implementations may include one of the above and/or below features, or any combination thereof.

**[0025]** In some implementations, the information received from the one of the audio playback devices is an updated set of global preset assignments.

**[0026]** In certain implementations, the remote server is configured to update the stored set of global preset assignments by replacing the stored set of global preset assignments with the updated set of global preset assignments.

**[0027]** In some implementations, the remote server is configured to distribute the update information to the other ones of the audio playback devices in response to requests for update information received from the other ones of the audio playback devices.

**[0028]** In certain implementations, the set of preset indicators are hardware buttons.

**[0029]** The preset indicators may include numerical identifiers.

**[0030]** Yet another aspect provides an audio playback device that is configured to operably connect to a plurality of digital audio sources. The audio playback device includes a digital-to-analog converter that is configured to receive a digital representation of content from the digital audio sources and convert to analog form; an electro-acoustic transducer; a set of user-selectable preset indicators. Each indicator in the set of preset indicators is configured to have assigned to it an entity associated with the plurality of digital audio sources. The audio playback device also includes a processor and instructions stored on a computer-readable media. The instructions, when executed, cause the processor to: update one or more preset assignments based on user input, and to cause the processor to send information regarding the update to the one or more preset assignments to a remote server. Each of the preset assignments represents an assignment of an entity associated with one of the digital audio sources to a corresponding one of the preset indicators.

**[0031]** Implementations may include one of the above and/or below features, or any combination thereof.

**[0032]** In some implementations, the audio playback device also includes an enclosure. The digital-to-analog converter and the electro-acoustic transducer are located within the enclosure and the set of user-selectable present indicators is located on the enclosure.

**[0033]** In certain implementations, the digital audio sources include at least (i) one or more libraries of user-defined playlists of digital music files and (ii) Internet radio sites.

**[0034]** In some implementations, the instructions, when executed, cause the processor to: notify one or more other audio playback devices within an audio system regarding the update to the one or more preset assignments.

**[0035]** In certain implementations, the instructions, when executed, cause the processor to: receive notification from an other audio playback device within an audio system regarding changes to preset assignments on the other audio playback device; and, in response to receiving the notification regarding changes to the preset assignments on the other audio playback device, to contact a remote server for the audio system to request update information; and to update one or more preset assignments on the audio playback device based on the update information received from the remote server such that preset assignments on the audio playback devices correspond to respective preset assignments on the other audio playback device.

**[0036]** According to another aspect, an audio playback device is configured to operably connect to a plurality of digital audio sources. The audio playback device includes a digital-to-analog converter configured to receive a digital representation of content from the digital audio sources and convert to analog form; an electro-acoustic transducer; and a set of user-selectable preset indicators. Each indicator in the set of preset indicators is configured to have assigned to it an entity associated with the plurality of digital audio sources. The audio playback device also includes a processor and instructions stored on a computer-readable media. The instructions, when executed, cause the processor to:

update one or more preset assignments based on user input; and to notify one or more other audio playback devices within an audio system regarding the update to the one or more preset assignments. Each of the preset assignments represents an assignment of an entity associated with one of the digital audio sources to a corresponding one of the preset indicators.

**[0037]** Implementations may include one of the above and/or below features, or any combination thereof.

**[0038]** In some implementations, the digital audio sources include at least (i) one or more libraries of user-defined playlists of digital music files and (ii) Internet radio sites.

**[0039]** In certain implementations, the assignable entities include at least individual Internet radio stations and particular user-defined playlists of digital music files.

**[0040]** In some implementations, the digital audio sources include a plurality of Internet radio sites, and the entities include individual radio stations provided by the Internet radio sites.

**[0041]** In certain implementations, the instructions, when executed, cause the processor to: receive notification from an other audio playback device within an audio system regarding changes to preset assignments on the other audio playback device; and, in response to receiving the notification regarding changes to the preset assignments on the other audio playback device, to contact a remote server for the audio system to request update information; and to update one or more preset assignments on the audio playback device based on the update information received from the remote server such that preset assignments on the audio playback devices correspond to respective preset assignments on the other audio playback device.

**[0042]** In a further aspect, an audio playback device is configured to operably connect to a plurality of digital audio sources. The audio playback device includes a digital-to-analog converter configured to receive a digital representation of content from the digital

audio sources and convert to analog form; an electro-acoustic transducer; and a set of user-selectable preset indicators. Each indicator in the set of preset indicators is configured to have assigned to it an entity associated with the plurality of digital audio sources. The audio playback device also includes a processor and instructions stored on a computer-readable media. The instructions, when executed, cause the processor to receive notification from an other audio playback device within an audio system regarding changes to preset assignments on the other audio playback device; and, in response to receiving the notification regarding changes to the preset assignments on the other audio playback device, to contact a remote server for the audio system to request update information; and to update one or more preset assignments on the audio playback device based on the update information received from the remote server such that preset assignments on the audio playback devices correspond to respective preset assignments on the other audio playback device. Each of the preset assignments represents an assignment of an entity associated with one of the digital music sources to a corresponding one of the preset indicators.

**[0043]** In yet another aspect, an audio system includes i) a plurality of audio playback devices, and ii) a software program configured to run on a separate device (e.g., a separate computer, smartphone, tablet, etc.). Each audio playback device is configured to operatively connect to a plurality of digital audio sources for playback of content from the digital audio sources. Each of the audio playback devices includes a set of preset indicators. Each preset indicator in the set of preset indicators is configured to have assigned to it an entity associated with one of the plurality of digital audio sources. The software program provides a user interface configured to present an audio playback device selection region that enables user to select one of the audio playback devices to control with the separate computer. The user interface is further configured to present a set of preset indicators that corresponds to the set of preset indicators of the selected one of the audio playback devices, and to present a source selection region that enables a user to select an entity to assign to one of the preset indicators of the selected one of the audio playback devices.

**[0044]** Implementations may include one of the above and/or below features, or any combination thereof.

**[0045]** In some implementations, the source selection region also enables a user to select an entity to provide audio content to the selected one of the audio playback devices for playback of the audio content.

**[0046]** In certain implementations, the user interface is further configured to present a global recents. The global recents list is a list of entities that is populated from audio content that the user has chosen to play on one or more of the audio playback devices.

**[0047]** In some implementations, the software program includes instructions to procure the global recents list from data stored on the selected one of the audio playback devices.

**[0048]** In certain implementations, the user interface is further configured to enable a user to select whether the preset assignments are to be global or local. The global preset assignments are synchronized across the plurality of audio playback devices such that preset assignments on any one of the audio playback devices correspond to respective preset assignments on each of the other audio playback devices, and, such that, if one of the preset assignments is changed on one of the audio playback devices, each of the other audio playback devices is updated such that a corresponding change is made to a corresponding preset assignment on each of the other audio playback devices. The local preset assignments are device-specific such that each of the audio playback devices can have a unique set of preset assignments and such that the preset assignments on any one of the audio playback devices do not necessarily correspond to the preset assignments on any of the other audio playback devices.

**[0049]** Another aspect features a computer-implemented method that includes storing a set of local preset assignments for each of a plurality of audio playback devices of an audio system. The local preset assignments are device-specific such that the local preset assignments for any one of the audio playback devices do not necessarily correspond to the local preset assignments for any of the other audio playback devices. The method also

includes receiving input regarding a change from a local setting to a global setting; receiving input regarding selection of one of the audio playback devices to serve as a master audio playback device; setting the set of stored local preset assignments associated with the selected, master audio playback device as a set of global preset assignments; and providing the global preset assignments to the other playback devices of the audio system so as to synchronize the preset assignments across the audio system, such that preset assignments on any one of the audio playback devices correspond to respective preset assignments on each of the other audio playback devices.

## BRIEF DESCRIPTION OF THE DRAWINGS

**[0050]** FIG. 1 is a schematic view of an audio system that facilitates synchronization of presets among various system devices.

**[0051]** FIG. 2 is a swim lane diagram showing steps of managing/synchronizing "global" presets within the audio system of FIG. 1.

**[0052]** FIG. 3 is a swim lane diagram showing steps of managing "local" presets within the audio system of FIG. 1.

**[0053]** FIG. 4 is a screen shot of a user interface provided by a controller which displays a recents list within the audio system of FIG. 1.

**[0054]** FIG. 5 is a swim lane diagram showing steps of managing/synchronizing "global" recents within the audio system of FIG. 1.

**[0055]** FIG. 6 is a swim lane diagram showing steps for management of "local" recents within the audio system of FIG. 1.

**[0056]** FIG. 7A and 7B are perspective and top plan views, respectively, of an exemplary audio playback device from the audio system of FIG. 1.

**[0057]** FIG. 7C is a block diagram of the audio playback device of FIG. 7A.

**[0058]** FIG. 8 is a swim lane diagram showing steps for browsing entities associated with one of the digital audio sources within the audio system of FIG. 1.

**[0059]** FIG. 9 is a block diagram of another implementation of an audio playback device that can be utilized in the audio system of FIG. 1.

**[0060]** FIG. 10 is a block diagram of an exemplary controller from the audio system of FIG. 1.

**[0061]** FIG. 11 is a block diagram of a software program for the controller of FIG. 10.

**[0062]** FIG. 12 is a state interaction diagram that shows an overview of four user interface states of a user application of the controller software program of FIG. 11.

**[0063]** FIG. 13 illustrates a high-level workflow for a setup state from the state interaction diagram of FIG. 12.

**[0064]** FIG. 14A is a swim lane diagram showing steps for music setup for an Internet music service within the audio system of FIG. 1.

**[0065]** FIG. 14B is a swim lane diagram showing steps for distribution of tokens for accessing account based digital audio sources such as certain Internet music services within the audio system of FIG. 1.

**[0066]** FIG. 15A and 15B show a graphical user interface for a main application state, from the state interaction diagram of FIG. 12, in a "Now Playing" mode and an "Explore" mode, respectively, which may be suitable for a controller in the form of a desktop or laptop computer.

**[0067]** FIG. 15C is the user interface of FIG. 15B showing a sub-list of entities associated with an audio source named "Global Internet Radio".

**[0068]** FIG. 16A, 16B, and 16C show an alternative implementation of a user interface for the main application state in a "Preset" mode, a "Now Playing" mode, and an "Explore" mode, respectively, which may be suitable for a controller in the form of mobile device such as a smart phone.

**[0069]** FIG. 17 illustrates a process flow for setting preset from a controller within the audio system of FIG. 1.

**[0070]** FIGS. 18A and 18B show a sequence of screen displays illustrating the setting of a preset assignment, by selecting and holding a preset indicator, in the "Now Playing" mode on a desktop or laptop computer.

**[0071]** FIGS. 19A and 19B show a sequence of screen displays illustrating the setting of a preset assignment, by right-clicking on one the preset indicators and selecting “Set Preset” from a right-click menu, in the “Now Playing” mode on a desktop or laptop computer.

**[0072]** FIGS. 20A and 20B show a sequence of screen displays illustrating the setting of a preset assignment, by selecting a preset indicator from a preset menu, in the “Now Playing” mode on a desktop or laptop computer.

**[0073]** FIGS. 21A through 21C show a sequence of screen displays illustrating the setting of a preset assignment, by drag and drop, in the “Now Playing” mode on a desktop or laptop computer.

**[0074]** FIGS. 22A and 22B show a sequence of screen displays illustrating the setting of a preset assignment, by drag and drop, in the “Explore” mode on a desktop or laptop computer.

**[0075]** FIG. 23 is a block diagram of a computing device that can be used to implement the server of the audio system of FIG. 1.

## DETAILED DESCRIPTION

**[0076]** This disclosure is based, at least in part, on the realization that it can be beneficial to synchronize presets among various devices within an audio system. It may be further beneficial to curate a list of recently access entities for providing audio content which can be shared among various devices within an audio system. Such features can help to facilitate quick and easy access to a user's preferred audio content.

**[0077]** SYSTEM OVERVIEW

**[0078]** Referring to FIG. 1, an audio system 100 for the delivery of digital audio (e.g., digital music) provides for easy, quick access to a variety of digital audio sources through the use of preset assignments. At a very high level, there are four main categories of devices in the audio system 100: (i) audio playback devices 110; (ii) digital audio sources 120a, 120b, 120c (collectively referenced as 120); controllers 130a, 130b, 130c (collectively referenced as 130); and a server 140.

**[0079]** The audio playback devices 110 are electronic devices which are capable of rendering audio content. These devices can access stored audio content (e.g., remotely stored audio content) and stream it for playback. In some cases, the audio playback devices 110 may also be capable of playing locally stored content. These devices render audio with the help of audio codecs and digital signal processors (DSPs) available within.

**[0080]** The audio playback devices 110 can communicate with each other. For example, each audio playback device 100 can communicate with the other audio playback devices 110 within the audio system 100 for synchronization. This can be a synchronization of device settings, such as synchronization of preset assignments, or, for synchronization of playback (e.g., such that all or a subset of the audio playback devices 110 play the same content simultaneously and synchronously).

**[0081]** The digital audio sources 120 are devices and/or services that provide access to one or more associated entities for supplying content (e.g., audio streams) to the audio playback devices 110, and which can be located remotely from the audio playback devices

110. An "entity," as used herein, refers to a grouping or collection of content for playback. Exemplary entities include Internet radio stations and user defined playlists. "Content" is data (e.g., an audio track) for playback. "Associated entity" refers to an entity that is associated with a particular audio source. For example, if the digital audio source 120 is an Internet music service such as Pandora®, an example associated entity would be a radio station provided by Pandora®.

**[0082]** For the purposes of the audio system 100, audio streams are considered to be data. They are processed as digital information that is converted to analog before presentation. Data streaming is the method by which data is moved from an audio source 120 to an audio playback device 110. Typically, there are two models for this data movement, push and pull. The audio system 100 is capable of managing this audio (data) streaming in both fashions; descriptions of these processes are as follows.

**[0083]** In a push model, the digital audio source 120 will move the data to the audio playback device 110 at a pace that it desires. The recipient (e.g., one of the audio playback devices 110) of the data will acknowledge the data and the digital audio source 120 will provide more data. This model requires the digital audio source 120 to be managing the throughput characteristics of the audio system 100. In a pull model, the audio playback device 110 will request data from the digital audio source 120 at a rate it desires. This allows the audio playback device 110 to read ahead if data is available.

**[0084]** The digital audio sources 120 each maintain a repository of audio content which can be chosen by the user to play. The digital audio sources 120 can be based on the Digital Living Network Alliance® (DLNA) or other Web based protocols similar to the Hypertext Transfer Protocol (HTTP). Some of the devices and services in this category include Internet based music services 120a such as Pandora®, Spotify®, and vTuner®; network-attached storage (NAS) devices 120b, and a media server daemon 120c (e.g., provided as a component of a computer-based controller).

**[0085]** The digital audio sources 120 include user defined playlists of digital music files available from network audio sources such as network-attached storage (NAS) devices

120b, and a DLNA server 120c which may be accessible to the audio playback devices 110 over a local area network such as a wireless (Wi-Fi) or wired (Ethernet) home network 150, as well as Internet radio sites 120a such as Pandora®, vTuner®, Spotify®, etc., which are accessible to the audio playback devices 110 over a wide area network 160 such as the Internet.

**[0086]** The controllers 130 are responsible for controlling the audio playback devices 110 and for browsing the audio sources 120 in the audio system 100. Some of the devices in this category include desktop computers, laptop computers, and mobile devices such as smart phones and tablets. These devices control the audio playback devices 110 via a wireless communication interface (e.g., IEEE 802.11 b /g, Bluetooth LE, infrared, etc.). The controllers 130 serve as an online management tool for a user's network enabled audio playback devices 110. The controllers 130 provide interfaces which enable to the user to perform one or more of the following: setup a connection to a Wi-Fi network; create an audio system account for the user, sign into a user's audio system account and retrieve information; add or remove an audio playback device 110 on a user's audio system account; edit an audio playback device's name, and update software; access the audio sources (via the audio playback devices 110); assign an entity (e.g., a playlist or radio station) associated with one of the audio sources 120 to a preset indicator; browse and select recents, where "recents" refers to recently accessed entities; use transport controls (play/pause, next/skip, previous), view "Now Playing" (i.e., content currently playing on an audio playback device 110) and album art; and adjust volume levels.

**[0087]** In some cases, the controllers 130 may include network controllers 130a, 130b and auxiliary controllers 130c. The network controllers 130a, 130b are controllers that communicate with the audio playback devices 110 over a wireless (Wi-Fi) network connection. The network controllers can include primary network controllers 130a and secondary network controllers 130b. The primary network controllers 130a can be utilized for: connecting an audio playback device 110 to a Wi-Fi network (via a USB connection between the audio playback device 110 and the primary network controller 130a); creating a system account for the user; setting up music services; browsing of content for playback;

setting preset assignments on the audio playback devices 110; transport control (e.g., play/pause, fast forward/rewind, etc.) for the audio playback devices 110; and selecting audio playback devices 110 for content playback (e.g., single room playback or synchronized multi-room playback). Devices in the primary network controller category can include desktop and laptop computers.

**[0088]** The secondary network controllers 130b may offer some, but not all, of the functions of the primary network controllers 130a. For example, the secondary network controllers 130b may not provide for all of the account setup and account management functions that are offered by the primary network controllers 130a. The secondary network controllers 130b may be used for: music services setup; browsing of content; setting preset assignments on the audio playback devices; transport control of the audio playback devices; and selecting audio playback devices 110 for content playback: single room or synchronized multi-room playback. Devices in the secondary network controller category can include mobile devices such as smart phones and tablets.

**[0089]** The auxiliary controllers 130c communicate wirelessly (e.g., via Bluetooth low energy (BTLE) or IR) with an associated (e.g., paired) one of the audio playback devices (item 110, FIG. 1). The auxiliary controllers 130c may offer limited functionality. The auxiliary controllers 130c may be used for: browsing of content; setting of preset assignments on the associated one of the audio playback devices 110; and transport control (play/pause, etc.) of the associated audio playback device.

**[0090]** The server 140 is a cloud-based server which contains (e.g., within an account database) information related to a user's audio system account. This includes user account information such as the list of the audio playback devices 110 within the system 100, device diagnostic information, preset assignments, etc. The server 140 will be connected to by the audio playback devices 140 and by the controllers 130 (e.g., by primary network controllers) for the purpose of preset management, as well as management of audio sources 120 and management of the user's audio system account.

Generally, the controllers 130 (e.g., network controllers 130a, 130b) will login to the server 140 with a user's login details and 'sync down' the required information to work with.

**[0091]** The audio playback devices 110 and one or more of the controllers 130 are coupled to a local area network (LAN) 150. Other devices such as one or more of the digital audio sources (e.g., a network-attached storage (NAS) device 120b) may also be coupled to the LAN 150. The LAN 150 may be a wired network, a wireless network, or a combination thereof. In one example, the devices (e.g., audio playback devices 110 and controllers 130 (e.g., primary and secondary controllers 130a, 130b)) within the LAN 150 are wirelessly coupled to the LAN 150 based on an industry standard such as IEEE 802.11 b/g. The LAN 150 may represent a network within a home, an office, or a vehicle. In the case of a residential home, the audio playback devices 110 may be arranged in different rooms (e.g., kitchen, dining room, basement, etc.) within the home. The devices within the LAN 150 connect to a user supplied access point 170 (e.g., a router) and subsequently to a wide area network (WAN) 160 (e.g., the Internet) for communication with the other digital audio sources 120 (Internet based music services 120a) and the server 140.

**[0092]** Notably, the audio system 100 can provide for the management of presets (a/k/a preset assignments) and recents. Presets are a set of (e.g., six) user-defined shortcuts to content, intended to provide quick access to entities associated with the digital music sources 120 from (1 of 6) preset indicators present on each of the audio playback devices 110. In some cases, the preset indicators can be hardware buttons. Alternatively, the preset indicators may be virtual buttons defined by regions on a touch sensitive display. The individual preset indicators can be denoted with numerical identifiers.

**[0093]** The preset indicators the audio playback devices 110 provide access to their respectively assigned entities irrespective of the associated digital audio source. More specifically, the preset indicators can provide for single press access to the respectively assigned entities, irrespective of the digital audio source. That is, a single press of a preset indicator will start the streaming and rendering of content from an entity assigned to that preset indicator regardless of the audio source providing that entity. In that regard, the

presets are said to be source agnostic in that they behave in the same manner regardless of the audio source. In some cases, the single press access can be facilitated with the distribution of tokens for accessing account based audio sources which normally require a user to login with account credentials.

**[0094]** The presets can be global or local at the user's option. The user can select the global or local option, e.g., during set up of the user's system account. If the user's account is set to provide for global presets, the preset assignments will be synchronized on all the audio playback devices 110 across the audio system 100 such that preset assignments on any one of the audio playback devices correspond to respective preset assignments on each of the other audio playback devices (e.g., such that preset indicator "1" on a first one of the audio playback devices is assigned to the same entity as preset indicator "1" on all of the other audio playback devices 110 in the audio system 100), and, such that, if one of the preset assignments is changed on one of the audio playback devices 110, each of the other audio playback devices 110 is automatically updated such that a corresponding change is made to a corresponding preset assignment on each of the other audio playback devices. The synchronization of the preset assignments is managed through a combination of communications between the audio playback devices 110 with the server 140, and communications among the audio playback devices 110 themselves. A copy of the global preset assignments is stored locally on each audio playback device 110 associated with the user's account, and a copy of the global preset assignments is also maintained on the server 140.

**[0095]** FIG. 2 is a swim lane diagram 200 showing steps of managing/synchronizing "global" presets. "Swim lane" diagrams may be used to show the relationship between the various "actors" in the processes and to define the steps involved in the processes. FIG. 2 (and all other swim lane Figures) may equally represent a high-level block diagram of components of the invention implementing the steps thereof. The steps of FIG. 2 (and all the other FIGS. employing swim lane diagrams) may be implemented on computer program code in combination with the appropriate hardware. This computer program code may be stored on storage media such as a diskette, hard disk, CD-ROM, DVD-ROM or

tape, as well as a memory storage device or collection of memory storage devices such as read-only memory (ROM) or random access memory (RAM). Additionally, the computer program code can be transferred to a workstation over the Internet or some other type of network.

**[0096]** Referring to FIG. 2, four swim lanes are shown including a lane for one of the controllers 210, a lane for a first one of the audio playback devices 212, a lane for the other audio playback devices 214, and a lane for the server 216. At step 220, a first audio playback device (i.e., a first one of the audio playback devices 110, FIG. 1) receives user input regarding the assignment of an entity associated with one of the digital audio sources to one of the preset indicators on the audio playback device. In some cases, the user provides input directly to the audio playback devices, such as by pressing one of the preset indicators on the audio playback device. Alternatively, the user may provide input via a user interface on a selected one of the controllers (218), and the controller communicates the user input to the first audio playback device (219).

**[0097]** At step 222, the first audio playback device updates one or more preset assignments based on the user input. Updating can include updating data corresponding to the preset assignments stored locally (e.g., within memory) on the audio playback device.

**[0098]** At step 224, the first audio playback device sends information regarding the update to the one or more preset assignments to the remote server for updating a set preset assignments stored on the server. The update information may include an updated set of preset assignments. The audio playback devices may communicate with the server via a hypertext transfer protocol. The first audio playback device may, for example, upload the update information to the server via an HTTP POST command.

**[0099]** The server receives the update information from the first audio playback device (226), and updates a set of preset assignments stored on the server (228). Updating the set of preset assignments can include replacing previously stored data (e.g., a previously

stored set of presets) with the updated information (e.g., an updated set of preset assignments).

**[00100]** At step 230, the first audio playback device sends a communication to each of the other audio playback devices (e.g., a separate notification to each of the other audio playback devices) in the audio system notifying the other playback devices that there has been a change to one or more preset assignments.

**[00101]** At step 232, the other audio playback devices receive the notification from the first audio playback device. In response to receiving the notification of change to the preset assignments, the other audio playback devices synchronize their preset assignments with the server. To achieve this synchronization, each of the audio playback devices sends a communication (e.g., an HTTP GET request) to the server requesting update information corresponding to the changes to the preset assignments (234).

**[00102]** At step 236, the server receives the requests from the other audio playback devices. In response to the requests received from the other audio playback devices, the server responds by providing update information (which may consist of an updated set of preset assignments) to the each of the other audio playback devices (238).

**[00103]** At step 240, the other playback devices receive the update information from the server. Upon receipt of the update information, the other playback devices update their respective preset assignments (i.e., by updating preset data) (242). Updating can include removing (deleting) old data and replacing with new, updated data. For example, updating can include replacing a previously stored set of preset assignments and replacing with an updated set of preset assignments. Following these steps all of the audio playback devices will have the same preset assignments, and the server will have a copy of the preset assignments.

**[00104]** Alternatively, if the user elects to set the user's system account to provide for local presets, the preset assignments will be device-specific such that the preset assignments on any one of the audio playback devices 110 will not necessarily correspond

to the preset assignments on any of the other audio playback devices 110. A copy of the respective local preset assignments is stored locally on each audio playback device 110 associated with the user's account, and a copy of the local preset assignments for each audio playback device 110 is also maintained on the server 140.

**[00105]** FIG. 3 is a swim lane diagram 300 illustrating steps for managing local presets. Three swim lanes are shown including a lane for one of the controllers 310, a lane for a first one of the audio playback devices 312, and a lane for the server 316. At step 320, a selected audio playback device (i.e., a selected one of the audio playback devices 110, FIG. 1) receives user input regarding the assignment of an entity associated with one of the digital audio sources to one of the preset indicators on the audio playback device. In some cases, the user provides input directly to the audio playback devices, such as by pressing one of the preset indicators. Alternatively, the user may provide input via a user interface on one of the controllers (318), and the controller communicates the user input to the selected audio playback device (319).

**[00106]** At step 322, the selected audio playback device updates one or more preset assignments based on the user input. Updating can include updating data corresponding to the preset assignments stored locally (e.g., within memory) on the selected audio playback device.

**[00107]** At step 324, the selected audio playback device sends information regarding the update to the one or more preset assignments to the remote server for updating a set of preset assignments stored on the server. The update information may include an updated set of preset assignments. The audio playback devices may communicate with the server via a hypertext transfer protocol. The first audio playback device may, for example, upload the update information to the server via an HTTP POST command.

**[00108]** The server receives the update information from the selected audio playback device (326), and updates a set of preset assignments stored on the server (328). Updating the set of preset assignments can include replacing previously stored data (e.g., a previously stored set of presets) with the updated information (e.g., an updated set of

preset assignments). When the presets are set to local, the server will maintain (store and update) a separate set of presets for each audio playback device in the audio system.

**[00109]** The maintenance of a copy of the respective preset assignments for each of the audio playback devices on the server can be beneficial, for example, where the user elects to change from a local setting to a global setting after the individual devices have already been programed with respective preset assignments. In such a situation, the server will prompt the user (e.g., via one of the controllers) to select one of the audio playback devices to serve as a master device. The server can then set the preset assignments for the selected master audio playback device as a set of global preset assignments and can provide the global preset assignments to the other audio playback devices in the audio system so as to synchronize the presets across the audio system.

**[00110]** The "recents list" (a/k/a "recents") is a list of entities that is populated from content that the user has chosen to play. Recent entities can include Internet radio stations (e.g., for Pandora® and vTuner®), and a "group of tracks" selected for Spotify® and stored music. The "group of tracks" is a "parent" of a currently playing track, based on whatever the user either browsed to or searched for (e.g., Album, Playlist, Genre > All, Artist > All, etc.). The controllers 130, and, in some cases, the audio playback devices 110, can provide access to the recents by displaying the recents list to the user and allowing the user to browse the recents list and select entities therefrom.

**[00111]** The recents can be limited to a predetermined number of entities (e.g., 50-100 entities). Alternatively or additionally, the recents may be limited by date. For example, the recents may be limited to entities accessed by the user within the last day, month, year, etc., with older entries being purged from the list.

**[00112]** FIG. 4 is an exemplary user interface 400 which may be provided by one of the controllers 130 (FIG. 1), and which displays the recents list 410. The recents entries can be presented in reverse chronological order. "Now playing" (currently playing) tracks, if any, can be presented at the top of the list when the recents are displayed to the user

(412), and may include an indication of where (i.e., on which of the audio playback devices) they are playing.

**[00113]** Other entities included in the recents list can be displayed along with an indication of the time since they were last started. Within the same day this can take the format of "X hours" + "Y minutes" + "ago" (414). For one day ago (e.g., between 24 and 48 hours ago), "Yesterday" is displayed (416). For more than one day ago (e.g., 48 hours or more) the time can be display in the format of "X days" + "ago" (418).

**[00114]** As described below, the controllers 130 can be utilized to control the music selection on the audio playback devices 110 on a device-by-device (i.e., audio playback device by audio playback device) basis. Selecting a "Now Playing" entity from the recents list joins the corresponding music stream if it is not already joined.

**[00115]** As with the presets, the recents can be global (applied to all audio playback devices associated with a user's account) or local (device-specific) at the user's option. The same local/global toggle can be leveraged for both the presets and the recents. That is, one "global/local" setting can dictate whether the presets and recents are global or local. In some cases, the default setting is "global."

**[00116]** FIG. 5 is a swim lane diagram 500 showing steps for managing global recents. Four swim lanes are shown in FIG. 5 including a lane for a selected one of the controllers 510, a lane for a first one of the audio playback devices 512, a lane for the other audio playback devices 514, and a lane for the server 516. At step 520, a first audio playback device (i.e., a first one of the audio playback devices 110, FIG. 1) receives user input regarding the selection of an entity associated with one of the audio sources for providing streamed audio. In this regard, the user may provide input via one of the controllers (518), and the controller can communicate the user input to the first audio playback device (519).

**[00117]** At step 522, the first audio playback device updates a recents list stored locally (e.g., within memory) on that audio playback device to include the recently selected entity.

**[00118]** At step 524, the first audio playback device sends information regarding the update to the recents list to the remote server for updating a recents list stored on the server. The update information may include an updated recents list. The audio playback devices may communicate with the server via a hypertext transfer protocol. The first audio playback device may, for example, upload the update information to the server via an HTTP POST command.

**[00119]** The server receives the update information from the first audio playback device (526), and updates a recents list stored on the server (528). Updating the recents list can include replacing previously stored data (e.g., a previously stored recents list) with the updated information (e.g., an updated recents list).

**[00120]** At step 530, the first audio playback device sends a communication to each of the other audio playback devices (e.g., a separate notification to each of the other audio playback devices) in the audio system notifying the other playback devices that there has been a change to the recents list.

**[00121]** At step 532, the other audio playback devices receive the notification from the first audio playback device. In response to receiving the notification of change to the recents list, the other audio playback devices synchronize their locally stored copies of the recents list with the server. To achieve this synchronization, each of the audio playback devices sends a communication (e.g., an HTTP GET request) to the server requesting update information corresponding to the changes to the recents list (534).

**[00122]** At step 536, the server receives the requests from the other audio playback devices. In response to the requests received from the other audio playback devices, the server responds by providing update information (which may consist of an updated recents list) to each of the other audio playback devices (538).

**[00123]** At step 540, the other playback devices receive the update information from the server. Upon receipt of the update information, the other playback devices update their respective copies of the recents list (i.e., by updating recent data) (542). Updating can

include removing (deleting) old data and replacing with new, updated data. For example, updating can include replacing a previously stored recents list and replacing with an updated recents list. Following these steps all of the audio playback devices will have the same recents list, and the server will have a copy of the recents list.

**[00124]** When a user browses recents using one of the controllers, the controller will retrieve the recents list stored locally on a selected one of the audio playback devices for display to the user. Thus, when recents are set to global, the user will be presented with the same list of entities regardless of which one of the audio playback devices the user selects to control though the controller.

**[00125]** FIG. 6 is a swim lane diagram 600 showing steps for managing local recents. Three swim lanes are shown including a lane for one of the controllers 610, a lane for a selected one of the audio playback devices 612, and a lane for the server 616. At step 520, a selected audio playback device (i.e., a selected one of the audio playback devices 110, FIG. 1) receives user input regarding the selection of an entity associated with one of the audio sources for providing streamed audio. In this regard, the user may provide input via one of the controllers (518), and the controller can communicate the user input to the first audio playback device (519).

**[00126]** At step 522, the selected audio playback device updates a recents list stored locally (e.g., within memory) on that audio playback device to include the recently selected entity.

**[00127]** At step 524, the selected audio playback device sends information regarding the update to the recents list to the remote server for updating a recents list stored on the server. The update information may include an updated recents list. The audio playback devices may communicate with the server via a hypertext transfer protocol. The first audio playback device may, for example, upload the update information to the server via an HTTP POST command.

**[00128]** The server receives the update information from the selected audio playback device (526), and updates a recents list stored on the server (528). Updating the recents list can include replacing previously stored data (e.g., a previously stored recents list) with the updated information (e.g., an updated recents list). Thus, when recents are set to local, the user will be presented with the a device specific list of entities that corresponds to the entities that had been most recently accessed by the audio playback device that the user selects to control though the controller. The server will maintain a separate recents list for each audio playback device in the audio system.

**[00129]** The maintenance of a copy of the respective recents lists for each of the audio playback devices on the server can be beneficial, for example, where the user elects to change from a local setting to a global setting after the individual devices have already curated their respective recents lists. In such a situation, the server can prompt the user (e.g., via one of the controllers) to select one of the audio playback devices to serve as a master device. The server can then set the recents list for the selected master audio playback device as a global recents list and can provide the global recents list to the other audio playback devices in the audio system so as to synchronize the recents list across the audio system.

**[00130]** AUDIO PLAYBACK DEVICES

**[00131]** An exemplary audio playback device 110 will now be described in greater detail with reference to FIGS. 7A through 7C. Referring to FIG. 7A, an audio playback device 110 includes an enclosure 710 and on the enclosure 710 there resides a graphical interface 712 (e.g., an OLED display) which can provide the user with information regarding currently playing ("Now Playing") music and information regarding the presets. A screen 714 conceals one or more electro-acoustic transducers 715 (FIG. 7C). The audio playback device 110 also includes a user input interface 716. As shown in FIG. 7B, the user input interface 716 includes a plurality of preset indicators 718, which are hardware buttons in the illustrated example. The preset indicators 718 (numbered 1-6) provide the user with easy, one press access to entities assigned to those buttons. That is, a single

press of a selected one of the preset indicators 718 will initiate streaming and rendering of content from the assigned entity.

**[00132]** The assigned entities can be associated with different ones of the digital audio sources (items 120a, 120b, 120c, FIG. 1) such that a single audio playback device 110 can provide for single press access to various different digital audio sources. In one example, the assigned entities include at least (i) user-defined playlists of digital music and (ii) Internet radio stations. In another example, the digital audio sources include a plurality of Internet radio sites, and the assigned entities include individual radio stations provided by those Internet radio sites.

**[00133]** Notably, the preset indicators 718 operate in the same manner, at least from the user's perspective, regardless of which entities are assigned and which of the digital audio sources provide the assigned entities. That is, each preset indicator 718 can provide for single press access to its assigned entity whether that entity is a user-defined playlist of digital music provided by an NAS device or an Internet radio station provided by an Internet music service.

**[00134]** With reference to FIG. 7C, the audio playback device 110 also includes a network interface 720, a processor 722, audio hardware 724, power supplies 726 for powering the various audio playback device components, and memory 728. Each of the processor 722, the graphical interface 712, the network interface 720, the processor 722, the audio hardware 724, the power supplies 726, and the memory 728 are interconnected using various buses, and several of the components may be mounted on a common motherboard or in other manners as appropriate.

**[00135]** The network interface 720 provides for communication between the audio playback device 110 and the controller (e.g., items 130a-c, FIG.1), the server (item 140, FIG. 1), the audio sources (items 120, FIG. 1) and other audio playback devices 110 via one or more communications protocols. The network interface 720 may provide either or both of a wireless interface 730 and a wired interface 732. The wireless interface 730 allows the audio playback device 110 to communicate wirelessly with other devices in

accordance with a communication protocol such as such as IEEE 802.11 b/g. The wired interface 732 provides network interface functions via a wired (e.g., Ethernet) connection.

**[00136]** In some cases, the network interface 720 may also include a network media processor 734 for supporting Apple AirPlay® (a proprietary protocol stack/suite developed by Apple Inc., with headquarters in Cupertino, California, that allows wireless streaming of audio, video, and photos, together with related metadata between devices). For example, if a user connects an AirPlay® enabled device, such as an iPhone or iPad device, to the LAN 150, the user can then stream music to the network connected audio playback devices 110 via Apple AirPlay®. A suitable network media processor is the DM870 processor available from SMSC of Hauppauge, New York. The network media processor 734 provides network access (i.e., the Wi-Fi network and/or Ethernet connection can be provided through the network media processor 734) and AirPlay® audio. AirPlay® audio signals are passed to the processor 722, using the $I^2S$ protocol (an electrical serial bus interface standard used for connecting digital audio devices), for downstream processing and playback. Notably, the audio playback device 110 can support audio-streaming via AirPlay® and/or DLNA's UPnP protocols, and all integrated within one device.

**[00137]** All other digital audio coming from network packets comes straight from the network media processor 734 through a USB bridge 736 to the processor 722 and runs into the decoders, DSP, and eventually is played back (rendered) via the electro-acoustic transducer(s) 715.

**[00138]** The network interface 710 can also include a Bluetooth low energy (BTLE) system-on-chip (SoC) 738 for Bluetooth low energy applications (e.g., for wireless communication with a Bluetooth enabled controller (item 130c, FIG. 1)). A suitable BTLE SoC is the CC2540 available from Texas Instruments, with headquarters in Dallas, Texas.

**[00139]** Streamed data pass from the network interface 720 to the processor 722. The processor 722 can execute instructions within the audio playback device (e.g., for performing, among other things, digital signal processing, decoding, and equalization functions), including instructions stored in the memory 728. The processor 722 may be

implemented as a chipset of chips that include separate and multiple analog and digital processors. The processor 722 may provide, for example, for coordination of other components of the audio playback device 110, such as control of user interfaces, applications run by the audio playback device 110. A suitable processor is the DA921 available from Texas Instruments.

**[00140]** The processor 722 provides a processed digital audio signal to the audio hardware 724 which includes one or more digital-to-analog (D/A) converters for converting the digital audio signal to an analog audio signal. The audio hardware 724 also includes one or more amplifiers which provide amplified analog audio signals to the electroacoustic transducer(s) 715 for playback. In addition, the audio hardware 724 may include circuitry for processing analog input signals to provide digital audio signals for sharing with other devices in the acoustic system 100.

**[00141]** The memory 728 stores information within the audio playback device 110. In this regard, the memory 728 may store account information, such as the preset and recent information discussed above. The memory 728 may also provide storage for "tokens" for facilitating single press access to the digital audio sources 120 (e.g., the Internet radio services of FIG. 1). A token, as used herein, is a unique identifier that may be provided by the digital audio source 120 and which allows the digital audio source 120 to recognize the audio playback device 110 as being associated with a user's account with the digital audio source 120 and without requiring the user to enter credentials (e.g., user name, password, etc.) each time the audio playback device 110 attempts to access the digital audio source 120.

**[00142]** The memory 728 may include, for example, flash memory and/or non-volatile random access memory (NVRAM). In some implementations, instructions (e.g., software) are stored in an information carrier. The instructions, when executed by one or more processing devices (e.g., the processor 722), perform one or more processes, such as those described above (e.g., with respect to FIGS. 2, 3, 5, and 6). The instructions can also be stored by one or more storage devices, such as one or more computer- or

machine-readable mediums (for example, the memory 728, or memory on the processor). The instructions may include instructions for performing decoding (i.e., the software modules include the audio codecs for decoding the digital audio streams), as well as digital signal processing and equalization.

**[00143]** The instructions may also include instructions for enabling certain "browsing" functionality. That is, at least in some cases, the controllers ( items 130a-c, FIG. 1) serve as graphical remote controls for the audio playback devices 110 and do not communicate with the digital audio sources 120 (FIG. 1) directly, but, instead, communicate with the digital audio sources 120 via the audio playback devices 110.

**[00144]** FIG. 8 is a swim lane diagram 800 showing steps for browsing entities (e.g., stations) associated with one of the digital audio sources (items 120a-c, FIG. 1). Three swim lanes are shown in FIG. 8 including a lane for a selected one of the controllers 810, a lane for a selected one of the audio playback devices 812, and a lane for a selected one of the digital audio sources 813.

**[00145]** At step 820, the controller receives input from a user requesting a list of stations (entities) from a selected one of the digital audio sources (i.e., a digital audio source, within the audio system, that is selected by the user via a user interface provided by the controller). At step 822, the controller sends the request to a selected one of the audio playback devices (i.e., an audio playback device, within the audio system, that is selected by the user via a user interface provided by the controller).

**[00146]** At step 824, the selected one of the audio playback devices receives the request from the controller. In response, the audio playback device connects to the selected digital audio source via the router and Internet connection and requests a list of entities (e.g., stations) associated with that source (826).

**[00147]** At step 828, the selected one of the digital audio sources receives the request from the audio playback device. In response to the request from the audio playback device, the audio source sends a list of available entities to the audio playback device

(830). The audio playback device receives the list of available entities (832) and the audio playback device sends the list of available entities along to the controller (834).

**[00148]** The controller receives the list of available entities from the audio playback device (836) and displays the list to the user (838).

**[00149]** FIG. 9 illustrates another implementation of an audio playback device 110' in which the audio playback device hardware is divided between the enclosure 710 and a separate device ("dongle 900"). The dongle 900 can be connected to the enclosure 710 via a wired connection 902. In the illustrated example of FIG. 9, the network interface 720, the processor 722, the audio hardware 724, and the power supplies 726 are located within a housing 904 of the dongle 900. The graphical interface 712 and the user input interface 716 are located on the enclosure 710. The enclosure 710 encloses the electro-acoustic transducer(s) 715 and may also include additional electronics 906 (e.g., processors, amplifiers, D/A converters, A/D converters, power supplies, etc.) for processing, converting and amplifying audio content from local audio sources (e.g., audio content stored in memory within the enclosure 710, a CD connected to the audio playback device, a portable music device such as an IPod connected to the audio playback device 110', etc.).

**[00150]** CONTROLLERS

**[00151]** Referring to FIG. 10, an exemplary controller 130 includes a processor 1000, a memory 1010, a display 1012, a user input interface 1014, and a network interface 1016, among other components. The controller 130 may also be provided with a mass storage device 1018, such as a hard drive, a micro-drive, or other device, to provide additional storage. Each of the processor 1000, the memory 1010, the display 1012, and the network interface 1016 are interconnected using various buses, and several of the components may be mounted on a common motherboard or in other manners as appropriate.

**[00152]** The processor 1000 can execute instructions (e.g., software) within the controller 130, including instructions stored in the memory 1010 or in a secondary storage device (e.g., mass storage device 1018). The processor 1000 may be implemented as a chipset

of chips that include separate and multiple analog and digital processors. The processor 1000 may provide, for example, for coordination of other components of the controller 130, such as control of user interfaces, applications run by the controller 130, and network communication by the controller 130. The processor 1000 may communication with a user through the display 1012 and the user input interface 1014.

**[00153]** The processor 1000 may communicate with the user through a display interface 1020 coupled to the display 1012. The display 1012 may include an LCD monitor, or a touch sensitive display (e.g., in the case of a mobile device). The display interface 1020 may comprise appropriate circuitry for driving the display 1012 to preset graphical and other information to the user.

**[00154]** The user input interface 1014 may include one or more user input devices such as a keyboard, a pointer device such as a mouse, and/or a touch sensitive display. In some cases, the same device (e.g., a touch sensitive display) may be utilized to provide the functions of the display 1012 and the user input interface 1014.

**[00155]** The network interface 1016 facilitates wireless communication (e.g., Wi-Fi, Bluetooth, IR, etc.) with one or more of the audio playback devices (item 110, FIG. 1) via a corresponding network interface (item 720, FIG. 7C) on the audio playback device 110.

**[00156]** The memory 1010 stores information within the controller 130. In some implementations, the memory 1010 is a volatile memory unit or units. In some implementations, the memory 1010 is a non-volatile memory unit or units. The memory 1010 may also be another form of computer-readable medium, such as magnetic or optical disk.

**[00157]** The mass storage device 1018 is capable of providing mass storage for the controller 130. In some implementations, the mass storage device 1018 may be or contain a computer readable medium, such as a floppy disk device, a hard disk device, an optical disk device, or a tape device, a flash memory or other similar solid state memory device, or an array of devices.

**[00158]** Instructions (e.g., software) can be stored in an information carrier. The instructions, when executed by one or more processing devices (e.g., the processor 1000), perform one or more processes, such as those described above (e.g., with reference to FIGS. 2, 3, 5, 6 and 8). The instructions can also be stored by one or more storage devices such as computer- or machine-readable mediums (for example, the memory 1010, the storage device 1018, or memory in the processor 1000).

**[00159]** Referring to FIG. 11, the controller software can include a user application 1100, a DLNA server daemon 1110, and a USB driver 1112. The user application 1100 is run by the user and can be started from a daemon in response to a Region Icon command. The user application 1100 includes computer-executable instructions (e.g., software modules) for system account creation and management (i.e., creating and managing a user's system account) (1114); audio playback device registration and configuration (1116); network management (1118); preset/recent management (1120); transport control (e.g., play/pause, rewind/forward, etc.) for the audio playback devices (1122); initiating firmware updates for the audio playback devices (1124); music services setup (1126); and context sensitive help (1128). Each of these functions can be provided by a corresponding software module.

**[00160]** The DLNA server daemon 1110 serves music from the user's computer (e.g., iTunes, Windows Media Player, or files in a folder) to audio playback devices 110. The DLNA server 1110 is installed as a system service and always runs when the computer (controller 130) is booted. The DLNA server daemon 1110 shows as a tray icon when running in the background and can continue to serve music even when the user application 1100 is shut down. The DLNA server daemon 1110 can provide the user with the options for enabling and disabling the serving of the selected music library.

**[00161]** The USB driver 1112 defines how the audio playback device 110 communicates with the controller 130 over a local USB connection. The USB driver 1112 is installed as a device driver. In some cases, the USB driver 1112 is just an .INF file (i.e., a plain text information file) that points to a standard USB driver. The USB driver 1112 can be loaded

by the controllers 130 operating system when the audio playback device 110 is connected via USB.

**[00162]** FIG. 12 is a state interaction diagram that shows an overview of various user interface states of the user application 1100. Referring to FIG. 12, the user application consists of four primary user interface (UI) states: a setup state 1210; a tutorial state 1212; a main application state 1214; and a settings state 1216.

**[00163]** A first run of the user application 1100 initiates the setup state 1210. The setup state 1210 performs network (e.g., Wi-Fi/Ethernet) setup, system account creation, and music services setup via the corresponding software modules (FIG. 11). After a first run of the user application 1100, the Wi-Fi setup is automatically triggered when an audio playback device 110 (FIG. 1) is connected to a controller 130 (FIG. 1) via USB.

**[00164]** When the setup state 1210 is completed, the user is shown a pop-up 1218 that gives him/her the option to view a tutorial, or to skip it and go directly to the main application state 1214. If the user elects to view the tutorial, the tutorial state 1212 runs and provides a step-by-step overview of how to use the main application UI state. As mentioned above, the secondary network controllers 130b (FIG. 1) may not offer all of the functionality of the primary network controllers 103a (FIG. 1). More specifically, the secondary network controllers 130b may not provide the setup functions offered by the primary network controllers 130a, and, consequently, the secondary network controllers 130b may start at step 1218.

**[00165]** When the tutorial 1212 is complete, or if the user elects to skip the tutorial, the main application state 1214 runs. The main application state 1214 is the primary application view that the user interfaces with.

**[00166]** The user can access the settings state 1216 via the main application state 1214 (e.g., settings can be a menu item that is selectable from the main application state 1214. The settings state 1216 is an interface for adjusting system settings. The settings state 1216 can be used to: (i) adjust account settings (e.g., change an account password, delete

an audio system account, etc.); (ii) adjust device settings (e.g., update software, change a device name, etc.); (iii) adjust presets and recents settings (e.g., change between local and global settings); (iv) adjust music services settings (e.g., add a music service, change location for local Internet radio, edit a Pandora® account, connect another Pandora® account); and adjust stored music settings (e.g., add or remove a music library).

**[00167]** FIG. 13 illustrates a high-level workflow for the setup state. The setup state 1210 consists of four main steps: Adding devices (e.g., audio playback devices and auxiliary controllers) to a user's system network (1310); audio playback device software update (1312); system account creation (1314); and music setup (1316).

**[00168]** The setup state 1210 is generally initiated when an audio playback device 110 is connected to the controller 130 via a USB connection. This starts the step of adding devices to an audio system network LAN 150 (FIG. 1), which will begin by prompting the user to select how the USB connected audio playback device 110 will connect to the LAN (item 150, FIG. 1) (e.g., via Wi-Fi connection or via Ethernet connection) (1320). Once the user selects the network connection type, the user will be prompted to setup the network connection (1322). This can include entering network credentials (e.g., entering a network name or selecting from a list of available networks and entering a password if the network is password protected).

**[00169]** Once a network connection is established, the user interface on the controller 130 can prompt the user to disconnect the audio playback device 110 from the controller 130 (i.e., disconnect the USB connection) and connect the audio playback device 110 to power where the user intends to use it, and then return to complete setup.

**[00170]** Next, the user interface can prompt the user to pair an auxiliary controller (BTLE controller) and can walk the user through the pairing process (1324). Then, the user can be prompted to setup additional devices (1326). Additional devices can be added by connecting via USB and going through the aforementioned steps for each subsequently added device.

**[00171]** In the next step (1328) of the setup process, device software is updated. The controller sends a command to the network connected audio playback devices to check for software updates (the software updates may be made available through the server and/or via a separate Internet service). The controller will prompt the user to update the audio playback devices if any updates are available and sends a command to the audio playback devices for update. The controller can indicate the software update progress via the user interface and can display a popup window in case of any errors.

**[00172]** Once updates are completed, the controller will guide the user through creating an audio system account or will prompt the user to sign in to an existing account (1330). The system account will be created on the server via direct interaction between the controller and the server.

**[00173]** Next, the controller guides the user through music setup (1316) which includes setting up the user's stored music sources including PC stored music, NAS devices, etc. (1332) as well as setting up Internet based audio sources (e.g., Pandora®, vTuner®, etc.) (1334).

**[00174]** In some cases, when setting up the digital audio sources, the user may be prompted to enter account credentials. For example, when adding a user's Pandora® account to the user's system account, the Pandora® Internet service may request account credentials from the user. In return, Pandora® will return a unique identifier ("token") that can be stored on the server and in memory on each of the audio playback devices and which will allow the audio playback devices subsequent access to the remote audio source without requiring login each time.

**[00175]** FIG. 14A is a swim lane diagram showing steps for music setup for a digital audio source such as an Internet music service. Three swim lanes are shown in FIG. 14A including a lane for one of the controllers 1410, a lane for a selected one of the audio playback devices 1412, and a lane for a selected one of the digital audio sources (e.g., an Internet music service such as Pandora®) 1414.

**[00176]** At step 1420, the controller receives user input requesting access to an Internet music service, and, at step 1422, sends the request to a selected one of the audio playback devices.

**[00177]** The selected audio playback device receives the request from the controller (1424) and sends the request to the Internet music source (1426). Internet music source receives request (1428) and responds with a request for login credentials (1430).

**[00178]** The selected audio playback device receives the request for credentials (1432) and sends the request to the controller (1434). At step 1436, the controller receives the request for login credentials, and, at step 1438, the controller displays the request for login credentials to the user.

**[00179]** At step 1440, the controller receives login credentials from the user, and, at step 1442, the controller sends the login credentials to the selected audio playback device. The selected audio playback device receives the login credentials (1444) and sends the credentials to the Internet music service (1446).

**[00180]** At step 1448, the Internet music service receives the login credentials, and, at step 1450, authenticates the user's account. If the user's account is authenticated, the Internet music service will grant access and return a token to the selected audio playback device (1452). As discussed above, the token allows the Internet music service to identify and associate the device with a user's Internet music service account, thus obviating the need for login credentials after music services setup.

**[00181]** The selected audio playback device receives the token (1454), and stores the token within memory in the selected audio playback device (1456). The token can then be distributed to other devices within the audio system to allow those other devices to similarly access the Internet music service.

**[00182]** FIG. 14B is a swim lane diagram showing steps for for distribution of tokens for accessing account based digital audio sources such as certain Internet music services.

Three swim lanes are shown in FIG. 14B including a lane for a first one of the audio playback devices 1460, a lane for the other audio playback devices in the audio system 1462, and a lane for the remote server 1464. The first one of the audio playback devices (the first audio playback device) corresponds to the selected one of the audio playback devices that was utilized by the selected one of the controllers to setup the Internet music service as described above with respect to FIG. 14A.

**[00183]** At step 1466, the first audio playback device sends a copy of the token received from the Internet music service to the server. The server receives the token from the first audio playback device (1468), and stores a copy of the token locally (e.g., within memory) on the server (1470).

**[00184]** At step 1472, the first audio playback device sends a communication to each of the other audio playback devices (e.g., a separate notification to each of the other audio playback devices) in the audio system notifying the other playback devices that there have been changes to the user's account (i.e., a new digital audio source has been added to the audio system).

**[00185]** At step 1474, the other audio playback devices receive the notification from the first audio playback device. In response to receiving the notification, each of the audio playback devices sends a communication to the server requesting information corresponding to the changes to the user's account (1476).

**[00186]** At step 1478, the server receives the requests from the other audio playback devices. In response to the requests received from the other audio playback devices, the server responds by providing the new account information (which may consist of a copy of the token for the recently added Internet music service) to each of the other audio playback devices (1480).

**[00187]** At step 1482, the other playback devices receive the new account information (e.g., a copy of the token) from the server. Upon receipt of the update information, the

other playback devices update their locally stored copies of the user's account information (i.e., by adding the token to stored data) (1483).

**[00188]** The distribution of "tokens" can help to facilitate single press access to the sources (e.g., via the preset indicators on the audio playback devices) to provide for source agnostic operation (i.e., the audio playback devices behave the same regardless of the source). This can help to allow the preset indicators on the audio playback devices to provide access to their respectively assigned entities irrespective of the associated digital audio source.

**[00189]** Referring to FIG. 15A, the user interface 1500 for the main application state includes: an audio playback device region 1510, a preset region 1512, and a source region 1514. The audio playback device region 1510 lists audio playback devices 1516 on the LAN (150, FIG. 1) that are available for control. User can select the audio playback device 1516 from the list of available devices. The device that is currently selected is centered in the region. This is the device for which now playing information, presets, and recents are shown. The audio playback device region 1510 includes a volume slider 1518 which can be used to control the volume of the selected device.

**[00190]** The preset region provides a list of preset indicators 1520 (in the form of virtual buttons) which correspond to the preset indicators (item 718, FIG. 7B) on the selected audio playback device. The list can include a description of the corresponding entity assigned to the preset indicator along with a numerical identifier for the preset indicator. Users can select a preset (e.g., by double-clicking) play content associated with the selected preset with the selected audio playback device. Or, as discussed below, the user can use the interface to assign entities to the presets.

**[00191]** The source region 1514 displays one of two modes of the main application. The two modes of the main application include a "Now Playing" mode (FIG. 15A) and an "Explore" mode (FIG. 15B). In the Now Playing mode, the source region 1514 displays album art 1522 for content being played by the selected audio playback device. The source region 1514 includes an identification of the audio source 1524 for the playing

content, as well as source specific now playing information 1526 such as Artist Name/Album Name/Track name. In Now Playing mode, the source region 1514 also includes source specific buttons 1528, which may include transport functions such as play, pause, skip forward, etc. Also displays an "Explore" button 1530 which allows the user to navigate to the Explore mode.

**[00192]** Referring to FIG. 15B, the Explore mode allows the user to browse available content and features. In the Explore mode, the source region 1514 displays one of a plurality of lists that the user can navigate through to select content to play, to select an entity to assign to a preset, to access Help content, and/or to manage settings.

**[00193]** A top-level Explore list (FIG. 15B) will include links 1532 to: digital audio sources (e.g., global and/or local Internet radio provided by vTuner®, stored music, Pandora®, etc.), recents list, help content, and the settings UI state. Audio sources with multiple accounts (e.g., multiple Pandora® accounts all associated with the user's system account) may be listed by date, with the first one set up listed first.

**[00194]** Selection of an audio source opens a sub-list of entities (FIG. 15C, showing sub-list of entities) associated with the selected source (the "Global Internet Radio" source (e.g., provided by vTuner®)) in the source region 1514. The sub-list of entities is generated via communication between the controller, the selected audio playback device, and the selected audio source as discussed above. A "Now Playing" button 1534 allows the user to navigate to the Now Playing mode.

**[00195]** FIGS. 16A through 16C illustrate another implementation of a graphical user interface 1600 for the main application that may be utilized for mobile devices. In the implementation of FIGS. 16A-16C, the main application can be in one of three modes: Presets mode (FIG. 16A), Now Playing mode (FIG. 16B), or Explore mode (FIG. 16C). The user can navigate between Presets, Now Playing, and Explore modes by swiping/navigating left/right amongst these modes.

**[00196]** Referring to FIG. 16A, the user interface 1600 for the main application includes: an audio playback device region 1612, a presets region 1614, and a source region 1616. The audio playback device region 1612 lists audio playback devices on the LAN (item 150, FIG. 1) that are available for control. User can select the audio playback device from the list of available devices. The Audio playback device region 1612 includes a volume slider 1616 which can be used to control the volume of the selected device.

**[00197]** The presets region 1614 includes a list of preset indicators 1620 (in the form of virtual buttons) which correspond to the preset indicators on the selected audio playback device. The preset indicators (item 718, FIG. 7B) are identified by corresponding numerical identifiers for each preset indicator. Users can select a preset (e.g., by double-clicking) play content associated with the selected preset with the selected audio playback device.

**[00198]** The source region 1616 displays the Presets mode, the Now Playing mode, or the Explore mode of the main application. In the Preset mode, shown FIG. 16A, the source region 1616 displays additional information for the device presets. The additional information can include a description of the corresponding entity assigned to the preset along with a numerical identifier for the preset button.

**[00199]** In the Now Playing mode (FIG. 16B), the source region 1616 displays album art 1618 for content being played by the selected audio playback device. The source region 1616 also includes an identification of the audio source 1620 for the playing content, as well as source specific now playing information 1622 such as Artist Name/Album Name/Track name. In the Now Playing mode, the source region 1616 also includes source specific buttons 1624, which may include transport functions such as play, pause, skip forward, etc.

**[00200]** The Explore mode (FIG. 16C) allows the user to browse available content and features. In the Explore mode, the source window displays one of a plurality of menus that the user can navigate through to select content to play, to select an entity to assign to a preset, to access Help content, and/or to manage settings.

**[00201]** A top-level Explore list will include links to: available audio sources, recents, help content, and the settings UI state. Audio sources with multiple accounts (e.g., multiple Pandora® accounts all associated with the user's system account) may be listed by date, with the first one set up listed first.

**[00202]** Selection of an audio source opens a sub-list of entities associated with the selected source in the source window. The sub-list of entities is generated via communication between the controller, the selected audio playback device, and the selected audio source as discussed above.

**[00203]** FIG. 17 illustrates a process 1700 for setting preset from a controller. The process 1700 includes selecting an audio playback device from the audio playback device region of the user interface (1710). The selected audio playback device will be the device that the controller utilizes to communicate with the digital audio sources. The process 1700 also includes assigning an entity to a preset indicator on the selected audio playback device (1712).

**[00204]** In this regard, preset assignments can be set from either the "Now Playing" mode or the "Explore" mode of the main application. Assigning from the Now Playing mode will assign entity associated with currently playing content to the selected preset.

**[00205]** FIGS. 18A and 18B show a sequence of screen displays illustrating the setting of a preset assignment from the Now Playing mode on a desktop or laptop computer. Referring to FIGS. 18A and 18B, the user selects (e.g., by clicking with pointing device (mouse) or tapping in the case of a touch sensitive screen) and holds one of the preset indicators 1800 to cause the preset indicator to be highlighted (FIG. 18A). After the selected preset indicator 1800 is held for a predetermined amount of time, the preset indicator 1800 will be assigned to the "Now Playing" entity. This may be indicated by a change in the text associated with the preset indicator 1800 (e.g., the text may be updated to reflect the newly associated entity's name, as shown in FIG. 18B). The new or updated preset assignment will take effect on the selected audio playback device 1810 (i.e., the device selected in the audio playback region) which is being controlled by the controller.

**[00206]** Alternatively, as illustrated in FIGS. 19A and 19B, the user can right-click on one the preset indicators 1900 and select "Set Preset" from a right-click menu 1910 to assign the entity associated with the currently playing content to be assigned to the selected preset indicator 1900.

**[00207]** Alternatively, Referring to FIGS. 20A and 20B, the main application state may include a menu bar 2000 with a "Set Preset" button 2010. The user can set a preset assignment by clicking on the "Set Preset" button 2010 to display a Preset menu 2012. The user can choose a preset from the preset menu 2012 to assign the entity (e.g., Internet radio station) associated with the "Now Playing" content to. Preset changes may be indicated by text changes to the station name associated with the preset indicator (FIG. 18B).

**[00208]** FIGS. 21A through 21C illustrate yet another method of setting a preset from the "Now Playing" mode. The user can click/tap 2100 and hold within the source region (FIG. 19A). The entity to be assigned to a preset appears in a pop-up 2110 in the clicked/tapped area (FIG. 19B). And the entity is dragged and dropped on the destination preset indicator 2112 (FIG. 19C).

**[00209]** FIGS. 22A and 22B illustrate a method of assigning a preset in the Browse mode. The user selects an entity 2200 from a list of entities 2210 and drags the selected entity to the preset indicator 2212 (FIG. 20A). The preset assignment is updated to reflect the change. This can be reflected by a text update on the preset indicator 2212 (FIG. 20B).

**[00210]** Alternatively, the preset assignment can be set or changed on the audio playback device itself by pressing and holding one of the preset indicators on the device's enclosure. This will assign an entity associated with currently plating content to the selected preset indicator.

**[00211]** Once a preset assignment is set for the first time or changed on one of the audio playback devices, the preset assignments can be synchronized across the audio system as described above with respect to FIG. 2.

**[00212]** SERVER

**[00213]** FIG. 23 illustrates an exemplary computing device 2300 that can be utilized to implement the server (item 140, FIG. 1). The computing device 2300 is intended to represent various forms of digital computers, such as servers, blade servers, mainframes, and other appropriate computers. The components shown here, their connections and relationships, and their functions, are meant to be examples only, and are not meant to be limiting.

**[00214]** The computing device 2300 includes a processor 2310, a memory 2312, a storage device 2314, a high-speed interface 2316 connecting to the memory 2312 and multiple high-speed expansion ports 2318, and a low-speed interface 2320 connecting to a low-speed expansion port 2322 and the storage device 2314. Each of the processor 2310, the memory 2312, the storage device 2314, the high-speed interface 2316, the high-speed expansion ports 2318, and the low-speed interface 2320 are interconnected using various busses, and may be mounted on a common motherboard or in other manners as appropriate. The processor 2310 can process instructions (e.g., a software program) for execution within the computing device 2300, including instructions stored in the memory 2312 or on the storage device 2314 to display graphical information for a GUI on an external input/output device, such as a display 2324 coupled to the high-speed interface 2316. In other implementations, multiple processors and/or multiple buses may be used, as appropriate, along with multiple memories and types of memory. Also, multiple computing devices may be connected, with each device providing portions of the necessary operations (e.g., as a server bank, a group of blade servers, or a multi-processor system).

**[00215]** The memory 2312 stores information within the computing device 2300. In some implementations, the memory 2312 is a volatile memory unit or units. In some implementations, the memory 2312 is a non-volatile memory unit or units. The memory 2312 may also be another form of computer-readable medium, such as a magnetic or optical disk.

**[00216]** The storage device 2314 is capable of providing mass storage for the computing device 2300. In some implementations, the storage device 2314 may be or contain a computer-readable medium, such as a floppy disk device, a hard disk device, an optical disk device, or a tape device, a flash memory or other similar solid state memory device, or an array of devices, including devices in a storage area network or other configurations. Instructions can be stored in an information carrier. The instructions, when executed by one or more processing devices (for example, processor 2310), perform one or more processes, such as those described above (e.g., with reference to FIGS. 2, 3, 5, 6, 14B). The instructions can also be stored by one or more storage devices such as computer- readable mediums (for example, the memory 2312, the storage device 2314, or memory on the processor 2310). The storage device 2314 may provide storage for a database 2324. The database can be used to store audio system account information.

**[00217]** The high-speed interface 2316 manages bandwidth-intensive operations for the computing device 2300, while the low-speed interface 2320 manages lower bandwidth-intensive operations. Such allocation of functions is an example only. In some implementations, the high-speed interface 2316 is coupled to the memory 2312, the display 2322 (e.g., through a graphics processor or accelerator), and to the high-speed expansion ports 2318, which may accept various expansion cards (not shown). In the implementation, the low-speed interface 2320 is coupled to the storage device 2314 and the low-speed expansion port 2322. The low-speed expansion port 2322, which may include various communication ports (e.g., USB, Bluetooth, Ethernet, wireless Ethernet) may be coupled to one or more input/output devices, such as a keyboard, a pointing device, a scanner, or a networking device such as a switch or router, e.g., through a network adapter.

**[00218]** The computing device 2300 may be implemented in a number of different forms, as shown in the figure. For example, it may be implemented as a standard server 2330, or multiple times in a group of such servers 2332. It may also be implemented as part of a rack server system.

**[00219]** Implementations of the systems and methods described above comprise computer components and computer-implemented steps that will be apparent to those skilled in the art. For example, it should be understood by one of skill in the art that the computer-implemented steps may be stored as computer-executable instructions on a computer-readable medium such as, for example, floppy disks, hard disks, optical disks, Flash ROMS, nonvolatile ROM, and RAM. Furthermore, it should be understood by one of skill in the art that the computer-executable instructions may be executed on a variety of processors such as, for example, microprocessors, digital signal processors, gate arrays, etc. In addition, the instructions may be implemented in a high-level procedural and/or object-oriented programming language, and/or in assembly/machine language. For ease of exposition, not every step or element of the systems and methods described above is described herein as part of a computer system, but those skilled in the art will recognize that each step or element may have a corresponding computer system or software component. Such computer system and/or software components are therefore enabled by describing their corresponding steps or elements (that is, their functionality), and are within the scope of the disclosure.

**[00220]** A number of implementations have been described. Nevertheless, it will be understood that additional modifications may be made without departing from the scope of the inventive concepts described herein, and, accordingly, other implementations are within the scope of the following claims.

What is claimed is:

1. A method for managing presets in an audio system, the method comprising:

syncing preset assignments on a plurality of audio playback devices such that preset assignments on any one of the audio playback devices correspond to respective preset assignments on each of the other audio playback devices, and, such that, if one of the preset assignments is changed on one of the audio playback devices, each of the other audio playback devices is automatically updated such that a corresponding change is made to a corresponding preset assignment on each of the other audio playback devices,

wherein each of the preset assignments is an assignment of an entity associated with one of a plurality of digital audio sources to one of a plurality of preset indicators on the corresponding one of the audio playback devices.

2. The method of claim 1, wherein the step of syncing preset assignments on a plurality of audio playback devices comprises:

receiving information from a first audio playback device of the audio system regarding a change to one or more of a plurality of preset assignments;

updating stored preset data based on the information received from the first audio playback device; and

providing update information to one or more other audio playback devices of the audio system such that the one or more other audio playback devices update their respective preset assignments to correspond to those of the first audio playback device.

3. The method of claim 2, wherein the step of updating stored preset data comprises updating preset data stored on a remote server.

4. The method of claim 2, wherein the step of updating stored preset data comprises replacing a first set of preset assignments with a second, updated set of preset assignments.

5. The method of claim 1, further comprising receiving user input regarding the assignment of an entity associated with one of the digital audio sources to one of the preset indicators on a first one of the audio playback devices.

6. The method of claim 5, wherein the user input corresponds to actuation of a hardware button on a first one of the audio playback devices.

7. The method of claim 5, wherein the user input is received via a controller connected to the first one of the audio playback devices via a network connection.

8. The method of claim 1, wherein the assignable entities include at least (i) user-defined playlists of digital music and (ii) Internet radio stations.

9. The method of claim 1, wherein the digital audio sources include a plurality of Internet radio sites, and the entities include individual radio stations provided by the Internet radio sites.

10. The method of claim 1, wherein the preset indicators provide access to their respectively assigned entities in the same manner irrespective of the associated digital audio source.

11. The method of claim 10, wherein the preset indicators provide for single press access to the respectively assigned entities, irrespective of the digital audio source.

12. An audio system server comprising:

a processor; and

instructions stored on a computer-readable media that, when executed, cause the processor to:

receive information from a first audio playback device of an audio system regarding a change to one or more of a plurality of preset assignments, each of the preset

assignments representing an assignment of an entity associated with one of a plurality of digital audio sources to a corresponding preset indicator;

update stored preset data based on the information received from the first device; and to

provide update information to one or more other audio playback devices of the audio system such that each of the one or more other audio playback devices update their respective preset assignments to correspond to those of the first audio playback device.

13. The audio system server of claim 12, wherein the audio system server is a cloud-based server.

14. The audio system server of claim 12, wherein the instructions, when executed, cause the processor to provide the update information to the one or more other audio playback devices in response to communication received from the one or more other audio playback devices requesting the update information.

15. The audio system server of claim 12, wherein the update information is an updated list of preset assignments.

16. The audio system server of claim 12, wherein the instructions, when executed, cause the processor to:

maintain a global recents list, wherein the global recents list is a list of entities that is populated from content that the user has chosen to play on one or more of the audio playback devices.

17. The audio system server of claim 16, wherein the instructions, when executed, cause the processor to:

receive information from a first audio playback device of an audio system regarding selection of a first entity for providing streamed music;

update stored recent data based on the information received from the first device; and to

provide updated recents information to one or more other audio playback devices of the audio system such that each of the one or more other audio playback devices updates a locally stored recents list to correspond to a recents list stored on the first audio playback device.

18. The audio system server of claim 12, wherein the instructions, when executed, cause the processor to:

receive a copy of a token from a first audio playback device of an audio system, wherein the token is a unique identifier that a corresponding one of the digital audio sources recognizes and associates with a user account, thereby to provide access to the user account;

store the copy of the token within the audio system server; and to

provide copies of the token other audio playback devices of the audio system such that the corresponding one of the digital audio sources can recognize the other audio playback devices as being associated with the user account.

19. An audio system comprising:

i) a plurality of audio playback devices, each audio playback device being configured to operatively connect to a plurality of digital audio sources for playback of content from the digital audio sources and each of the audio playback devices comprising:

a set of preset indicators, wherein each preset indicator in the set of preset indicators is configured to have assigned to it an entity associated with one of the plurality of digital audio sources; and

ii) a remote server configured to:

receive information from one of the audio playback devices regarding changes to preset assignments, each of the preset assignments representing an assignment of an entity associated with one of the digital audio sources to a corresponding one of the preset indicators;

update a stored set of global preset assignments based on the information received; and to

distribute update information to the other ones of the audio playback devices regarding changes to the global preset assignments,

wherein the other ones of the audio playback devices are configured to update their respective preset assignments based on the update information distributed from the remote server such that, following the update, all of the audio playback devices of the plurality of audio playback devices have the same preset assignments.

20. The audio system of claim 19, wherein the information received from the one of the audio playback devices is an updated set of global preset assignments.

21. The audio system of claim 19, wherein the remote server is configured to update the stored set of global preset assignments by replacing the stored set of global preset assignments with the updated set of global preset assignments.

22. The audio system of claim 19, wherein the remote server is configured to distribute the update information to the other ones of the audio playback devices in response to requests for update information received from the other ones of the audio playback devices.

23. The audio system of claim 19, wherein the assignable entities include at least individual Internet radio stations and particular user-defined playlists of digital music files.

24. The audio system of claim 19, wherein the set of preset indicators comprise hardware buttons.

25. The audio system of claim 19, wherein the preset indicators include numerical identifiers.

26. The audio system of claim 19, wherein the digital audio sources include a plurality of Internet radio sites, and the entities include individual radio stations provided by the Internet radio sites.

27. The audio system of claim 19, wherein the preset indicators provide access to their respectively assigned entities in the same manner irrespective of the associated digital audio source.

28. The audio system of claim 19, wherein the preset indicators provide for single press access to the respectively assigned entities, irrespective of the digital audio source.

29. An audio playback device configured to operably connect to a plurality of digital audio sources, the audio playback device comprising:

a digital-to-analog converter configured to receive a digital representation of content from the digital audio sources and convert to analog form;

an electro-acoustic transducer;

a set of user-selectable preset indicators, wherein each indicator in the set of preset indicators is configured to have assigned to it an entity associated with the plurality of digital audio sources;

a processor; and

instructions stored on a computer-readable media that, when executed, cause the processor to:

update one or more preset assignments based on user input, each of the preset assignments representing an assignment of an entity associated with one of the digital audio sources to a corresponding one of the preset indicators; and to

send information regarding the update to the one or more preset assignments to a remote server.

30. The audio playback device of claim 29, further comprising an enclosure, wherein the digital-to-analog converter and the electro-acoustic transducer are located within the enclosure and the set of user-selectable present indicators is located on the enclosure.

31. The audio playback device of claim 29, wherein the digital audio sources comprise at least (i) one or more libraries of user-defined playlists of digital music files and (ii) Internet radio sites.

32. The audio playback device of claim 31, wherein the assignable entities include at least individual Internet radio stations and particular user-defined playlists of digital music files.

33. The audio playback device of claim 29, wherein the set of preset indicators comprise hardware buttons.

34. The audio playback device of claim 29, wherein the preset indicators include numerical identifiers.

35. The audio playback device of claim 29, wherein the digital audio sources include a plurality of Internet radio sites, and the entities include individual radio stations provided by the Internet radio sites.

36. The audio playback device of cl aim 29, wherein the preset indicators provide access to the respectively assigned entities in the same manner irrespective of the associated digital audio source.

37. The audio playback device of claim 36, wherein the preset indicators provide for single press access to the respectively assigned entities irrespective of the digital audio source.

38. The audio playback device of claim 29, wherein the instructions, when executed, cause the processor to:

notify one or more other audio playback devices within an audio system regarding the update to the one or more preset assignments.

39. The audio playback device of claim 29, wherein the instructions, when executed, cause the processor to:

receive notification from an other audio playback device within an audio system regarding changes to preset assignments on the other audio playback device;

and, in response to receiving the notification regarding changes to the preset assignments on the other audio playback device, to contact a remote server for the audio system to request update information; and to

update one or more preset assignments on the audio playback device based on the update information received from the remote server such that preset assignments on the audio playback devices correspond to respective preset assignments on the other audio playback device.

40. An audio playback device configured to operably connect to a plurality of digital audio sources, the audio playback device comprising:

a digital-to-analog converter configured to receive a digital representation of content from the digital audio sources and convert to analog form;

an electro-acoustic transducer;

a set of user-selectable preset indicators, wherein each indicator in the set of preset indicators is configured to have assigned to it an entity associated with the plurality of digital audio sources; and

a processor; and

instructions stored on a computer-readable media that, when executed,

cause the processor to:

update one or more preset assignments based on user input, each of the preset assignments representing an assignment of an entity associated with one of the digital audio sources to a corresponding one of the preset indicators; and to

notify one or more other audio playback devices within an audio system regarding the update to the one or more preset assignments.

41. The audio playback device of claim 40, further comprising an enclosure, wherein the digital-to-analog converter and the electro-acoustic transducer are located within the enclosure and the set of user-selectable present indicators is located on the enclosure.

42. The audio playback device of claim 40, wherein the digital audio sources comprise at least (i) one or more libraries of user-defined playlists of digital music files and (ii) Internet radio sites.

43. The audio playback device of claim 40, wherein the assignable entities include at least individual Internet radio stations and particular user-defined playlists of digital music files.

44. The audio playback device of claim 40, wherein the set of preset indicators comprise hardware buttons.

45. The audio playback device of claim 40, wherein the preset indicators include numerical identifiers.

46. The audio playback device of claim 40, wherein the digital audio sources include a plurality of Internet radio sites, and the entities include individual radio stations provided by the Internet radio sites.

47. The audio playback device of claim 40, wherein the preset indicators provide access to the respectively assigned entities in the same manner irrespective of the associated digital audio source.

48. The audio playback device of claim 47, wherein the preset indicators provide for single press access to the respectively assigned entities irrespective of the digital audio source.

49. The audio playback device of claim 40, wherein the instructions, when executed, cause the processor to:

receive notification from an other audio playback device within an audio system regarding changes to preset assignments on the other audio playback device;

and, in response to receiving the notification regarding changes to the preset assignments on the other audio playback device, to contact a remote server for the audio system to request update information; and to

update one or more preset assignments on the audio playback device based on the update information received from the remote server such that preset assignments on the audio playback devices correspond to respective preset assignments on the other audio playback device.

50. An audio playback device configured to operably connect to a plurality of digital audio sources, the audio playback device comprising:

a digital-to-analog converter configured to receive a digital representation of content from the digital audio sources and convert to analog form;

an electro-acoustic transducer;

a set of user-selectable preset indicators, wherein each indicator in the set of preset indicators is configured to have assigned to it an entity associated with the plurality of digital audio sources;

a processor; and

instructions stored on a computer-readable media that, when executed, cause the processor to:

receive notification from an other audio playback device within an audio system regarding changes to preset assignments on the other audio playback device;

and, in response to receiving the notification regarding changes to the preset assignments on the other audio playback device, to contact a remote server for the audio system to request update information; and to

update one or more preset assignments on the audio playback device based on the update information received from the remote server such that preset assignments on the audio playback devices correspond to respective preset assignments on the other audio playback device, each of the preset assignments representing an assignment of an entity associated with one of the digital music sources to a corresponding one of the preset indicators.

51. The audio playback device of claim 50, further comprising an enclosure, wherein the digital-to-analog converter and the electro-acoustic transducer are located within the enclosure and the set of user-selectable present indicators is located on the enclosure.

52. The audio playback device of claim 50, wherein the digital audio sources comprising at least (i) one or more libraries of user-defined playlists of digital music files and (ii) Internet radio sites.

53. The audio playback device of claim 50, wherein the assignable entities include at least individual Internet radio stations and particular user-defined playlists of digital music files.

54. The audio playback device of claim 50, wherein the set of preset indicators comprise hardware buttons.

55. The audio playback device of claim 50, wherein the preset indicators include numerical identifiers.

56. The audio playback device of claim 50, wherein the digital audio sources include a plurality of Internet radio sites, and the entities include individual radio stations provided by the Internet radio sites.

57. The audio playback device of claim 50, wherein the preset indicators provide access to the respectively assigned entities in the same manner irrespective of the associated digital audio source.

58. The audio playback device of claim 57, wherein the preset indicators provide for single press access to the respectively assigned entities irrespective of the digital audio source.

59. An audio system comprising:

i) a plurality of audio playback devices, each audio playback device being configured to operatively connect to a plurality of digital audio sources for playback of content from the digital audio sources and each of the audio playback devices comprising:

a set of preset indicators, wherein each preset indicator in the set of preset indicators is configured to have assigned to it an entity associated with one of the plurality of digital audio sources; and

ii) a software program configured to run on a separate device, wherein the software program provides a user interface configured to present an audio playback device selection region that enables user to select one of the audio playback devices to control with the separate computer,

wherein the user interface is further configured to present a set of preset indicators that corresponds to the set of preset indicators of the selected one of the audio playback devices, and to

present a source selection region that enables a user to select an entity to assign to one of the preset indicators of the selected one of the audio playback devices.

60. The audio system of claim 59, wherein the source selection region also enables a user to select an entity to provide audio content to the selected one of the audio playback devices for playback of the audio content.

61. The audio system of claim 59, wherein the user interface is further configured to present a global recents list, wherein the global recents list is a list of entities that is populated from audio content that the user has chosen to play on one or more of the audio playback devices.

62. The audio system of claim 59, wherein the software program includes instructions to procure the global recents list from data stored on the selected one of the audio playback devices.

63. The audio system of claim 59, wherein the user interface is further configured to enable a user to select whether the preset assignments are to be global or local,

wherein global preset assignments are synchronized across the plurality of audio playback devices such that preset assignments on any one of the audio playback devices correspond to respective preset assignments on each of the other audio playback devices, and, such that, if one of the preset assignments is changed on one of the audio playback devices, each of the other audio playback devices is updated such that a corresponding change is made to a corresponding preset assignment on each of the other audio playback devices, and

wherein local preset assignments are device-specific such that each of the audio playback devices can have a unique set of preset assignments and such that the preset assignments on any one of the audio playback devices do not necessarily correspond to the preset assignments on any of the other audio playback devices.

64. A computer-implemented method comprising:

storing a set of local preset assignments for each of a plurality of audio playback devices of an audio system, wherein the local preset assignments are device-specific such that the local preset assignments for any one of the audio playback devices do not necessarily correspond to the local preset assignments for any of the other audio playback devices;

receiving input regarding a change from a local setting to a global setting;

receiving input regarding selection of one of the audio playback devices to serve as a master audio playback device;

setting the set of stored local preset assignments associated with the selected, master audio playback device as a set of global preset assignments; and

providing the global preset assignments to the other playback devices of the audio system so as to synchronize the preset assignments across the audio system, such that preset assignments on any one of the audio playback devices correspond to respective preset assignments on each of the other audio playback devices.

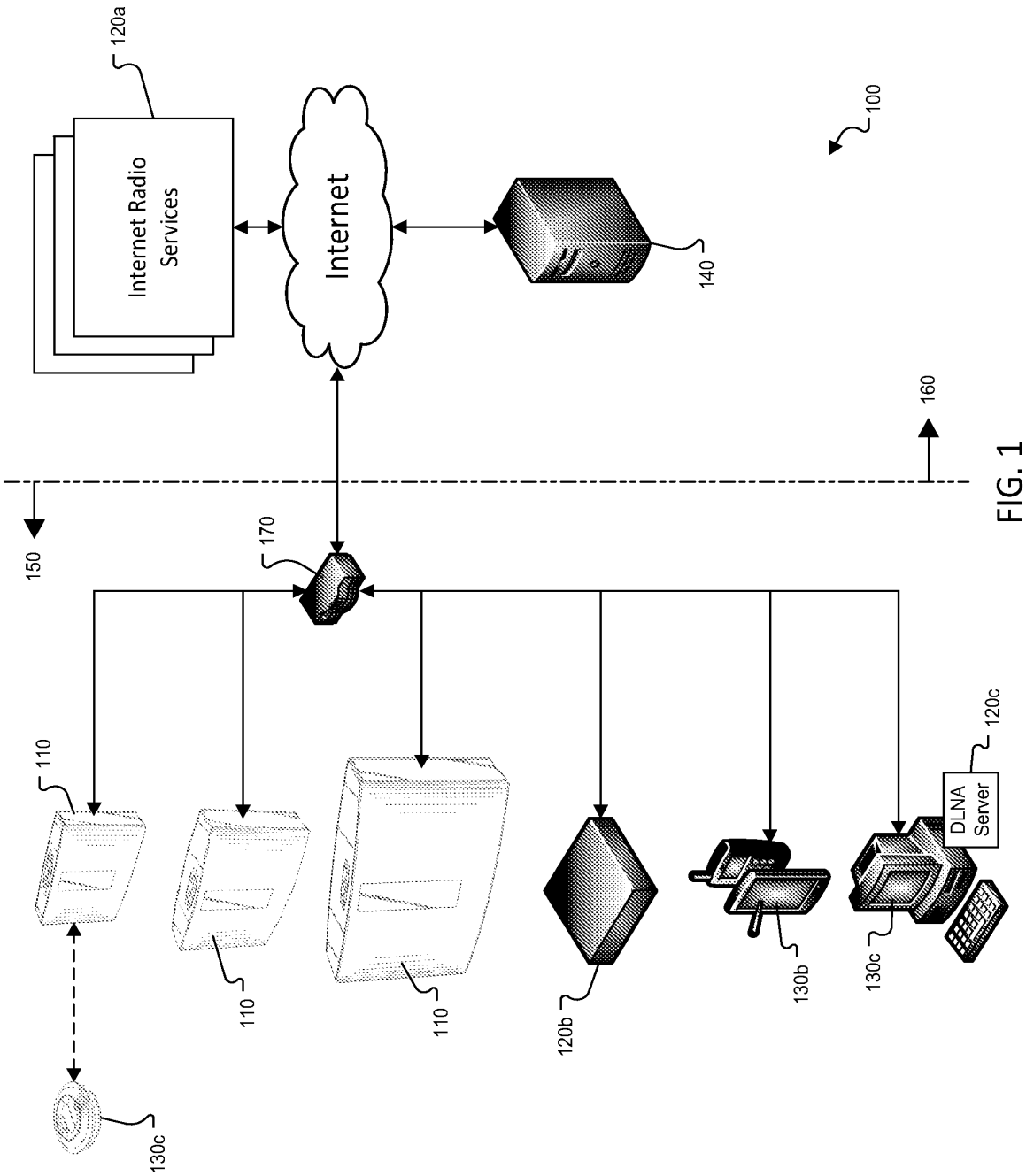

120a
Internet Radio Services
Internet
100
140
160
150
170
110
110
110
120b
130b
130c
DLNA Server
120c
130c

FIG. 1

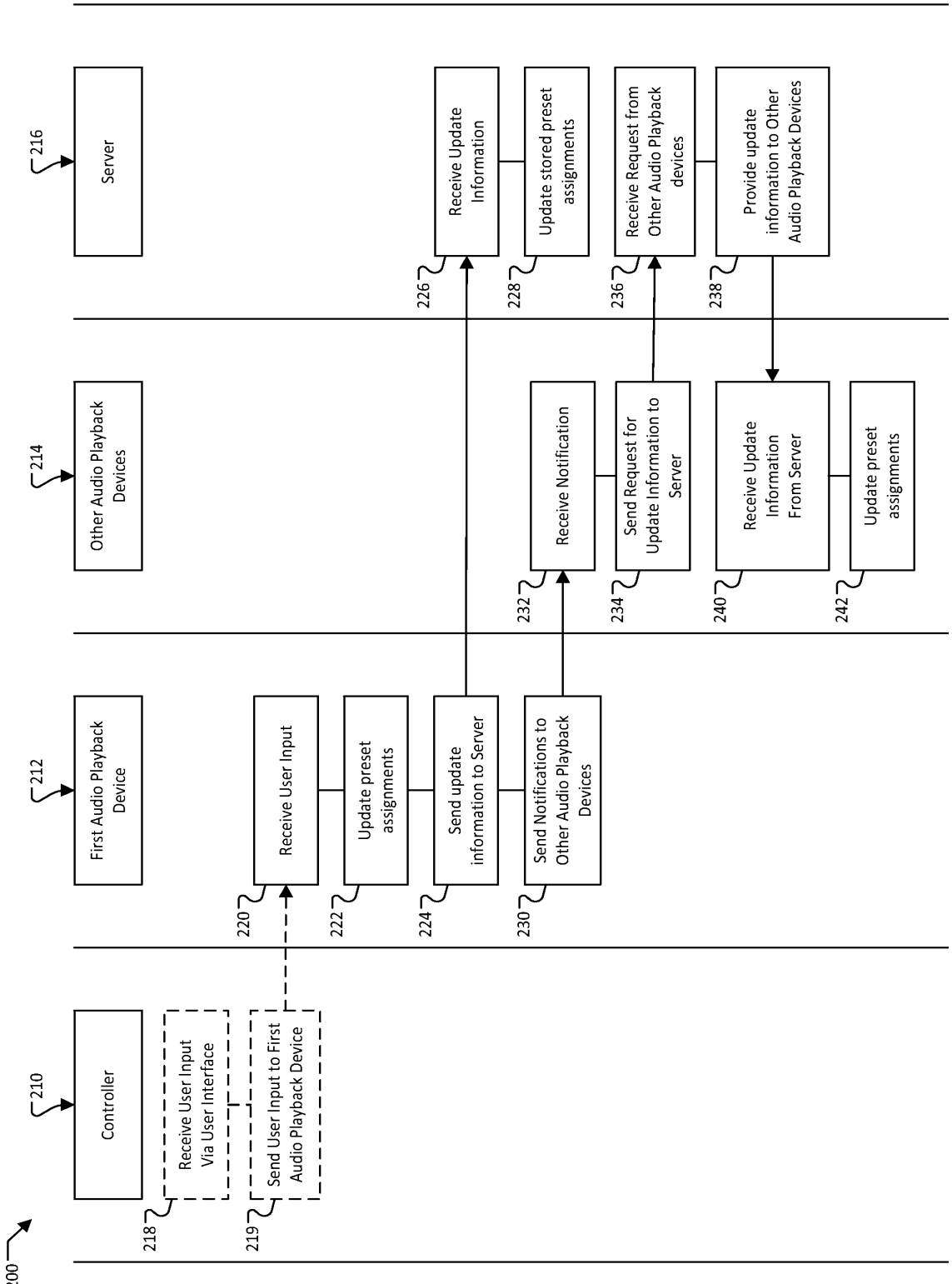

200
210
Controller
218
Receive User Input Via User Interface
219
Send User Input to First Audio Playback Device
212
First Audio Playback Device
220
Receive User Input
222
Update preset assignments
224
Send update information to Server
230
Send Notifications to Other Audio Playback Devices
214
Other Audio Playback Devices
232
Receive Notification
234
Send Request for Update Information to Server
240
Receive Update Information From Server
242
Update preset assignments
216
Server
226
Receive Update Information
228
Update stored preset assignments
236
Receive Request from Other Audio Playback devices
238
Provide update information to Other Audio Playback Devices

FIG. 2

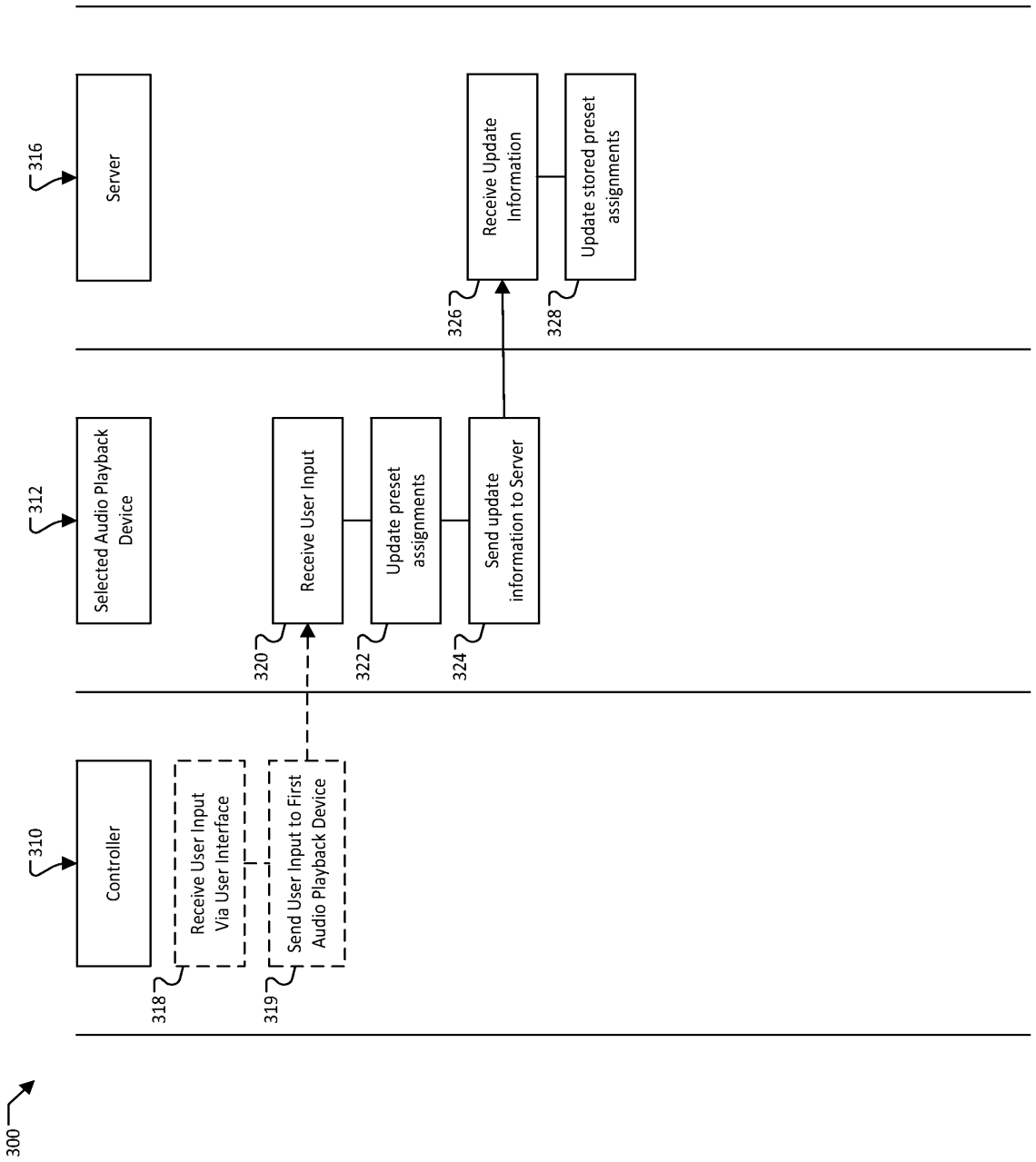

300
310
Controller
312
Selected Audio Playback Device
316
Server
318
Receive User Input Via User Interface
319
Send User Input to First Audio Playback Device
320
Receive User Input
322
Update preset assignments
324
Send update information to Server
326
Receive Update Information
328
Update stored preset assignments

FIG. 3

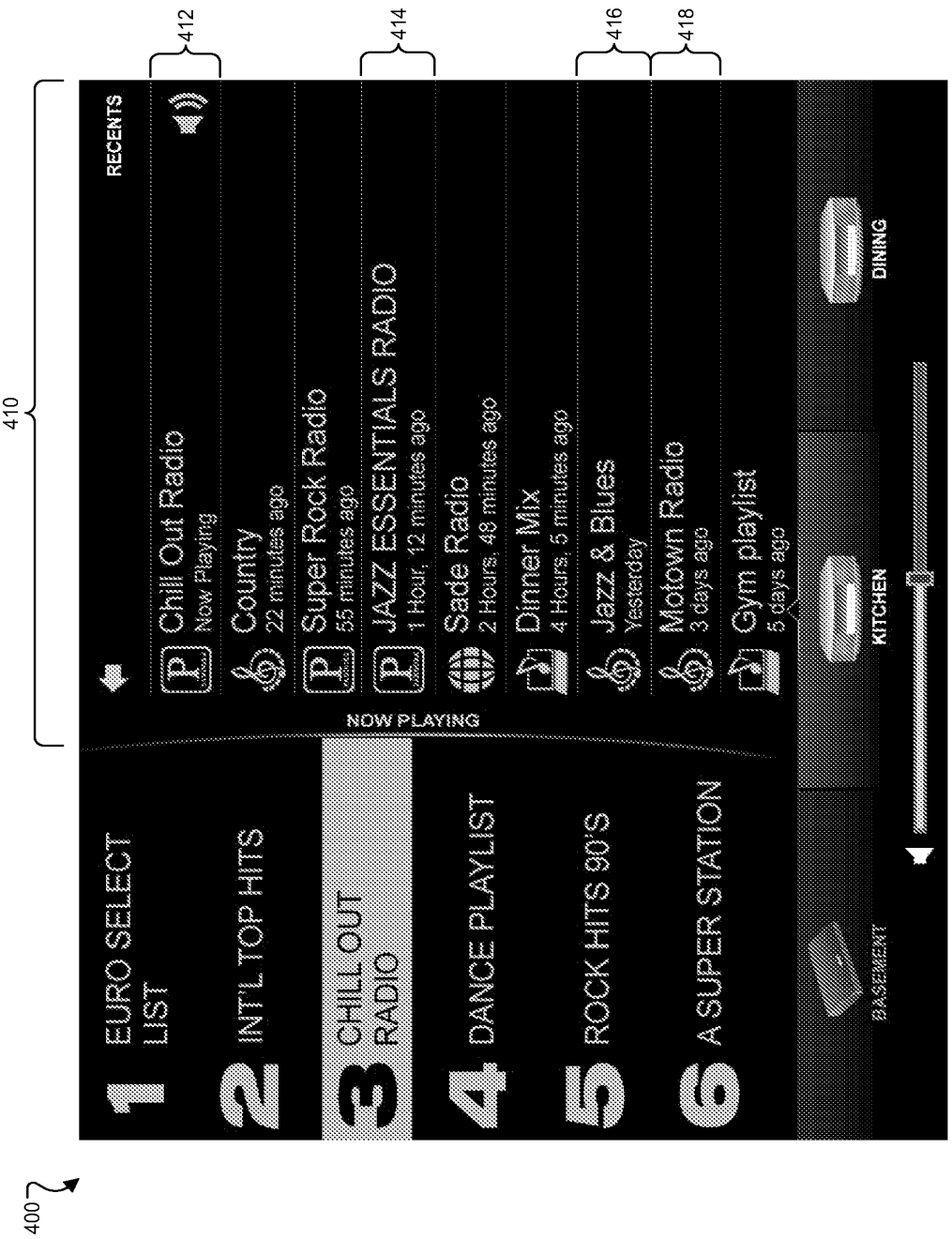

400
410
412
414
416
418
1 EURO SELECT LIST
2 INT'L TOP HITS
3 CHILL OUT RADIO
4 DANCE PLAYLIST
5 ROCK HITS 90'S
6 A SUPER STATION
NOW PLAYING
RECENTS
Chill Out Radio
Now Playing
Country
22 minutes ago
Super Rock Radio
55 minutes ago
JAZZ ESSENTIALS RADIO
1 Hour, 12 minutes ago
Sade Radio
2 Hours, 48 minutes ago
Dinner Mix
4 Hours, 5 minutes ago
Jazz & Blues
Yesterday
Motown Radio
3 days ago
Gym playlist
5 days ago
BASEMENT
KITCHEN
DINING

FIG. 4

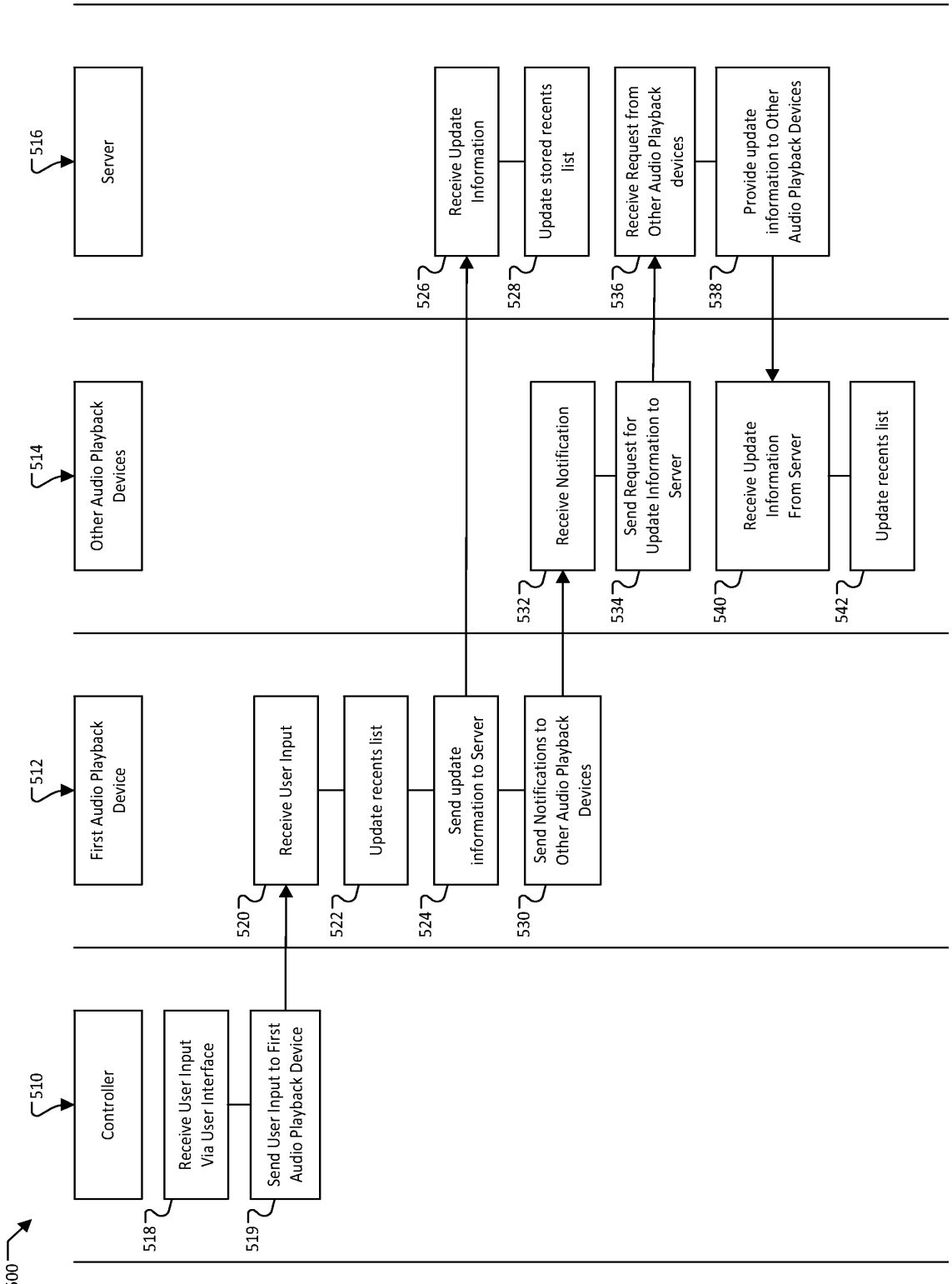

500
Controller
510
Receive User Input Via User Interface
518
Send User Input to First Audio Playback Device
519
First Audio Playback Device
512
Receive User Input
520
Update recents list
522
Send update information to Server
524
Send Notifications to Other Audio Playback Devices
530
Other Audio Playback Devices
514
Receive Notification
532
Send Request for Update Information to Server
534
Receive Update Information From Server
540
Update recents list
542
Server
516
Receive Update Information
526
Update stored recents list
528
Receive Request from Other Audio Playback devices
536
Provide update information to Other Audio Playback Devices
538

FIG. 5

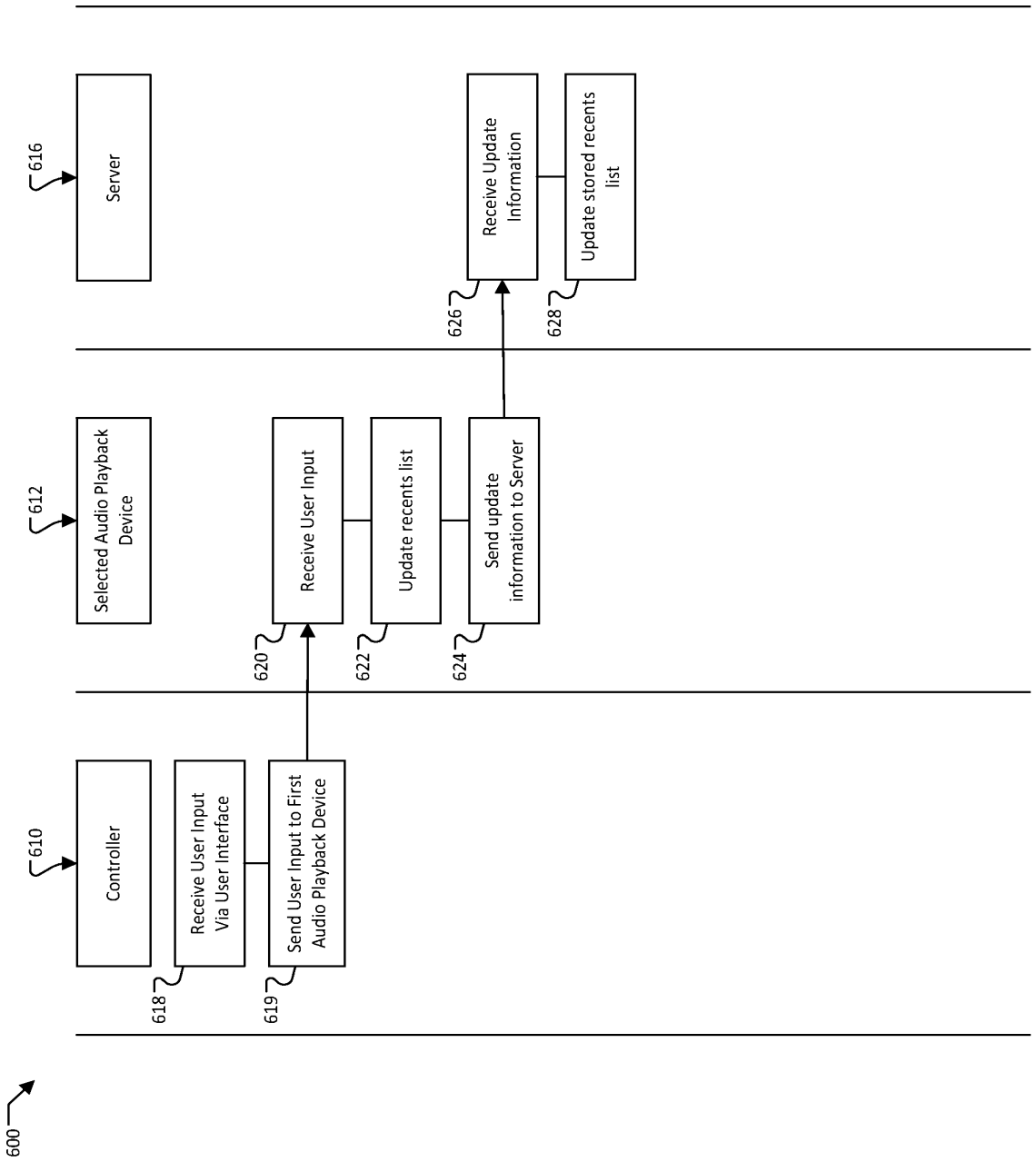

600
610
Controller
618
Receive User Input Via User Interface
619
Send User Input to First Audio Playback Device
612
Selected Audio Playback Device
620
Receive User Input
622
Update recents list
624
Send update information to Server
616
Server
626
Receive Update Information
628
Update stored recents list

FIG. 6

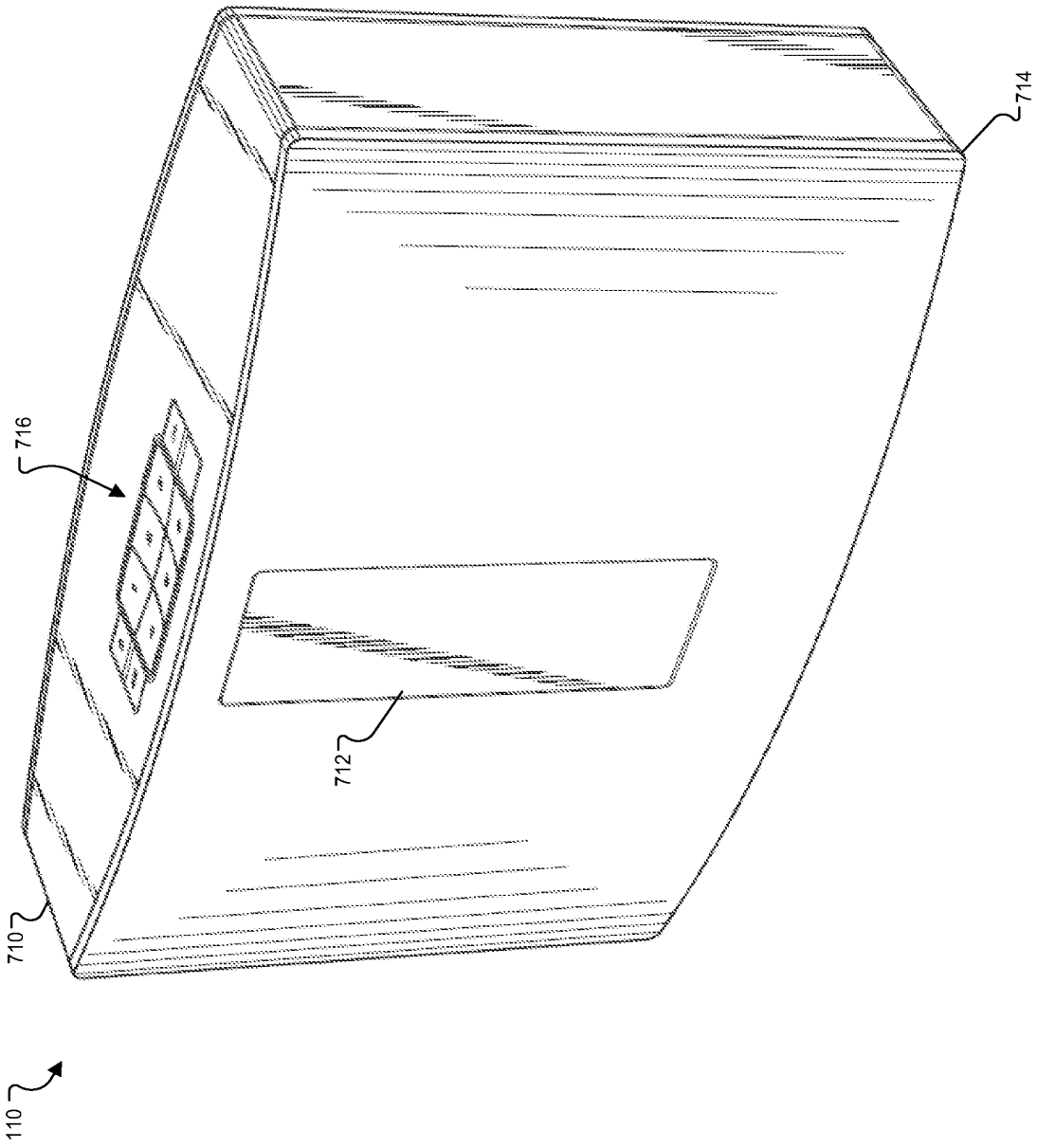



FIG. 7A

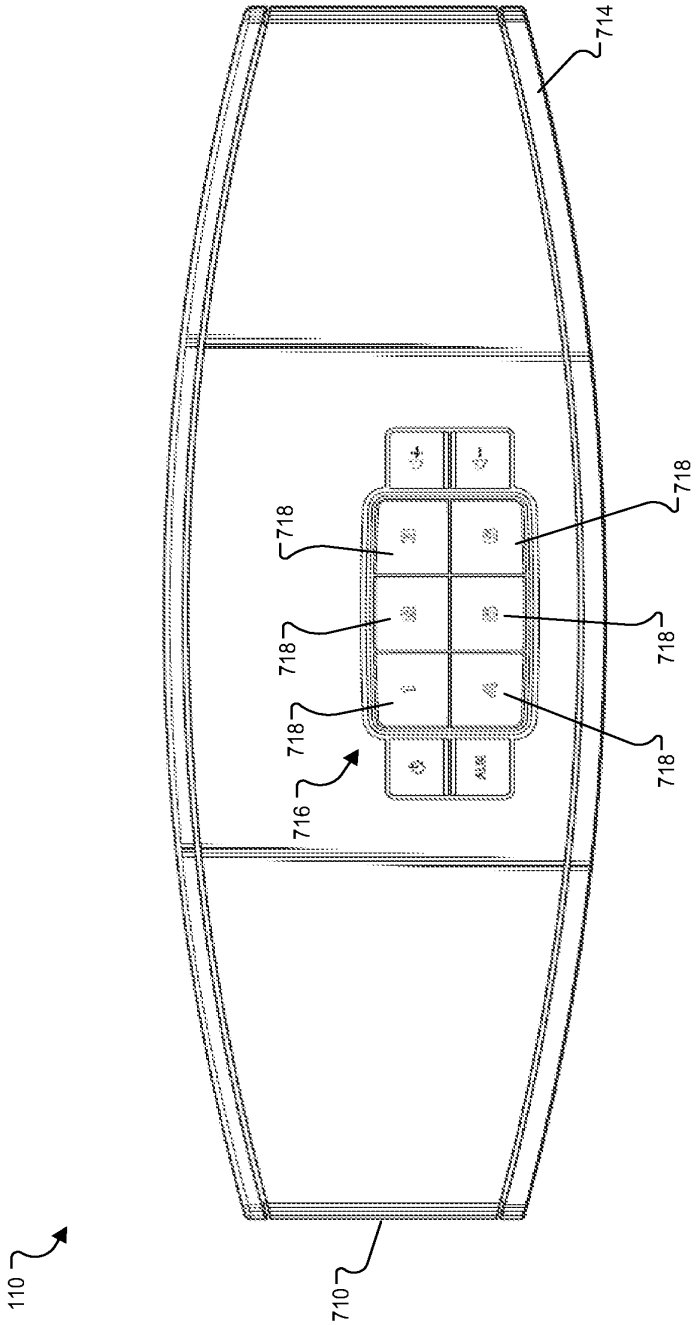



FIG. 7B

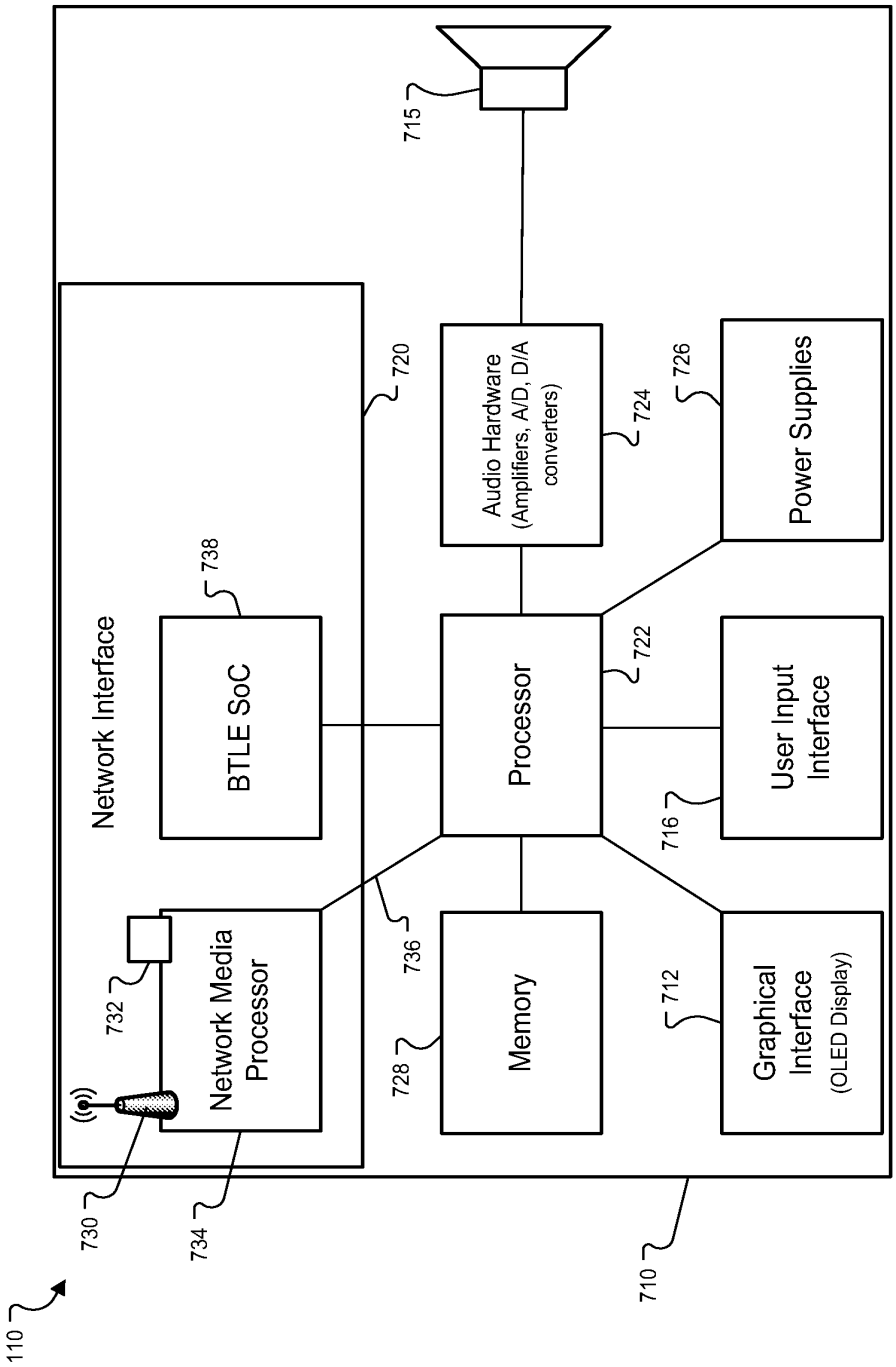

110
730
734
710
732
738
720
715
Network Interface
BTLE SoC
Network Media Processor
Processor
Audio Hardware (Amplifiers, A/D, D/A converters)
Power Supplies
User Input Interface
Memory
Graphical Interface (OLED Display)
736
728
712
724
726
722
716

FIG. 7C

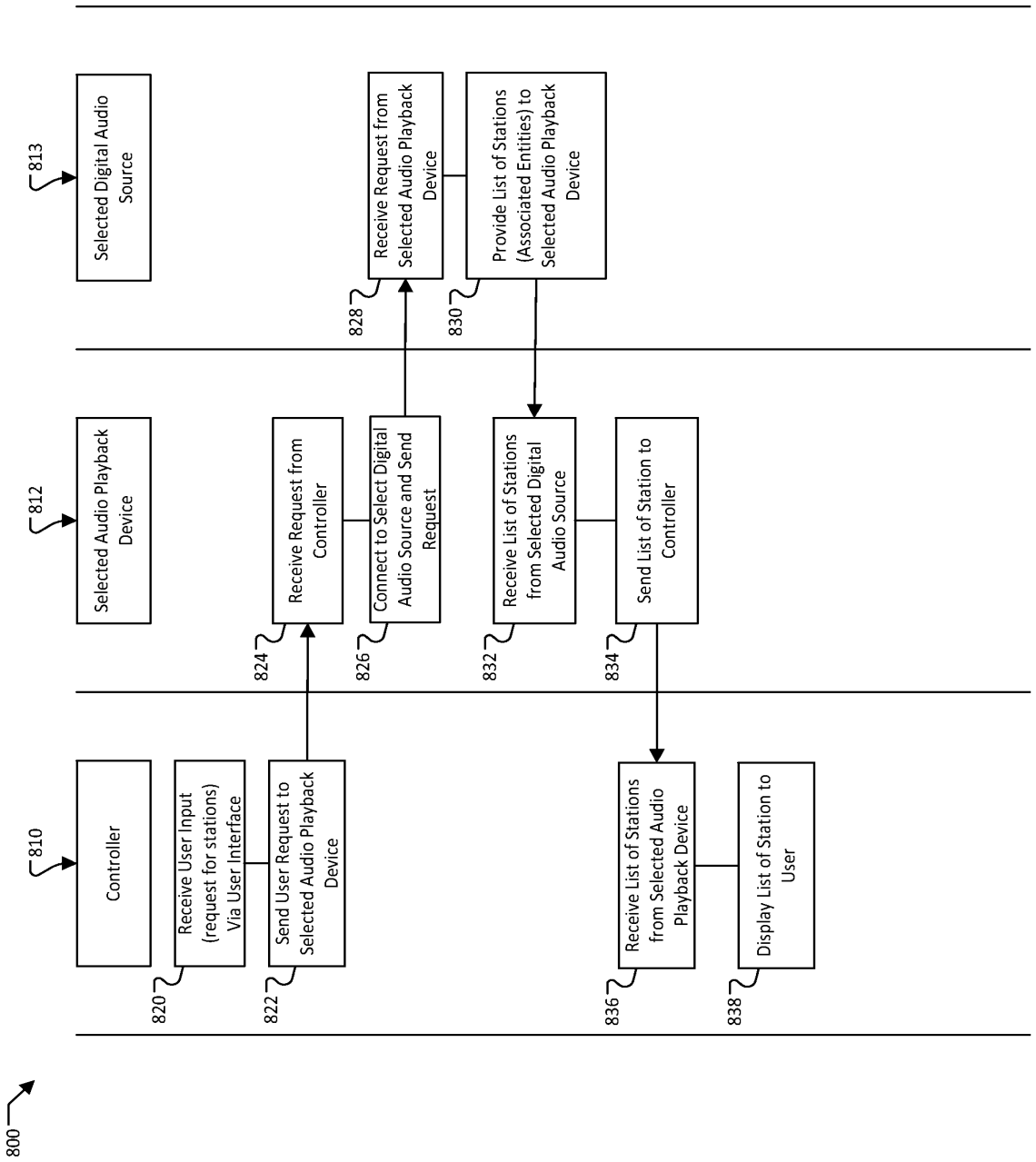

800
810
Controller
820
Receive User Input (request for stations) Via User Interface
822
Send User Request to Selected Audio Playback Device
812
Selected Audio Playback Device
824
Receive Request from Controller
826
Connect to Select Digital Audio Source and Send Request
828
Receive Request from Selected Audio Playback Device
813
Selected Digital Audio Source
830
Provide List of Stations (Associated Entities) to Selected Audio Playback Device
832
Receive List of Stations from Selected Digital Audio Source
834
Send List of Station to Controller
836
Receive List of Stations from Selected Audio Playback Device
838
Display List of Station to User

FIG. 8

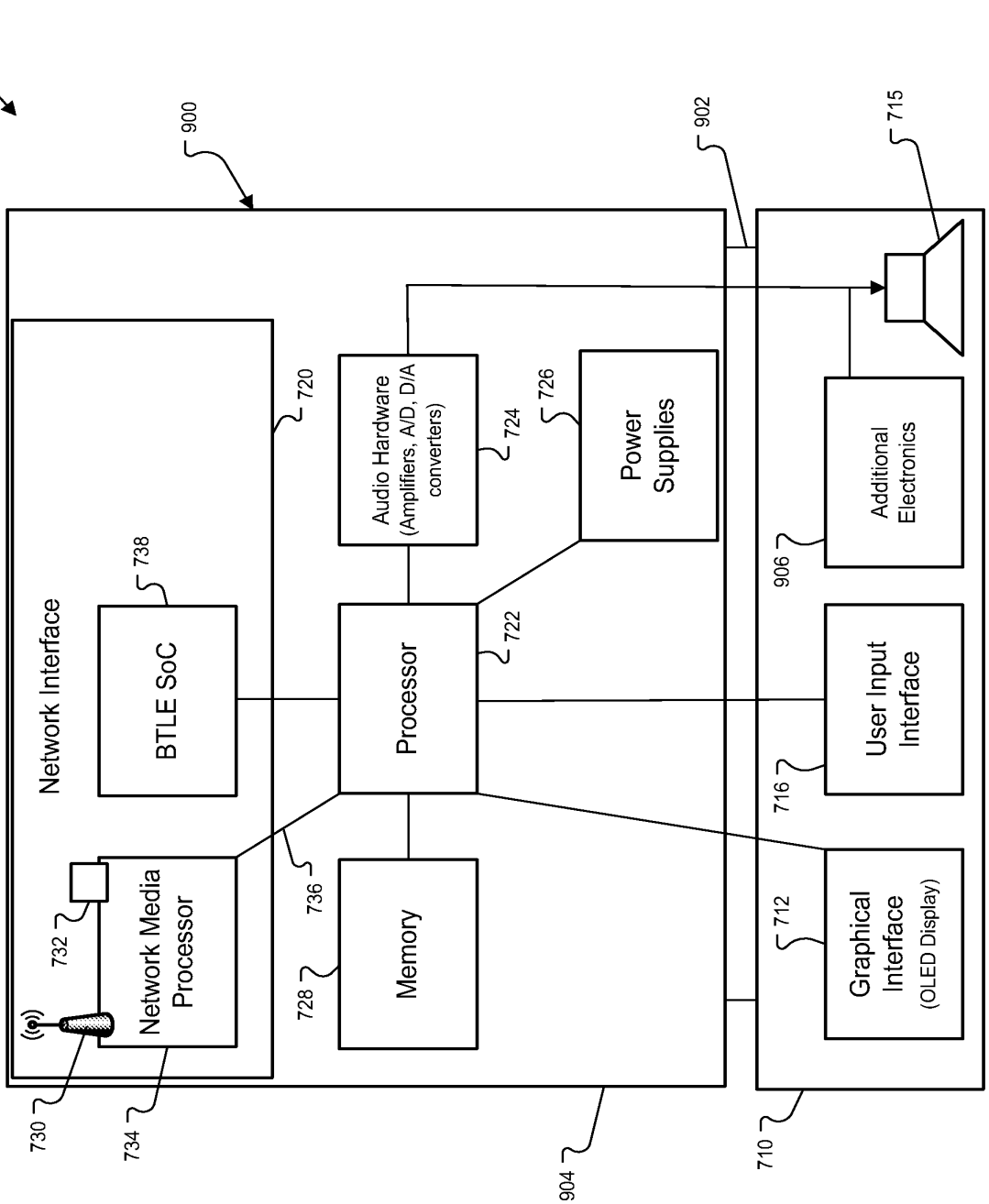

110'
900
902
715
720
Audio Hardware (Amplifiers, A/D, D/A converters)
724
726
Power Supplies
Additional Electronics
906
738
Network Interface
BTLE SoC
Processor
722
User Input Interface
716
732
Network Media Processor
736
Memory
728
712
Graphical Interface (OLED Display)
730
734
904
710

FIG. 9

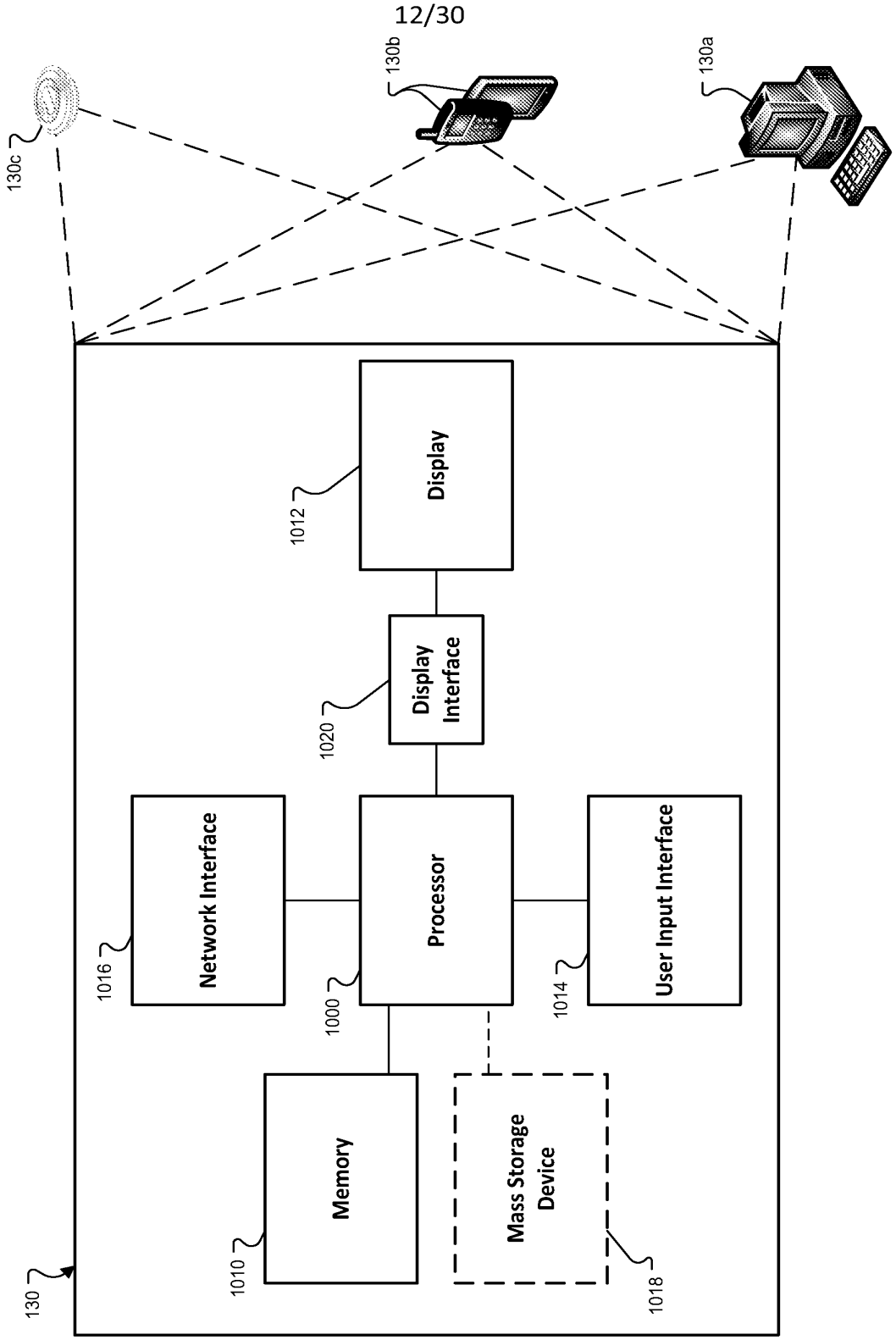

130c
130b
130a
Display
1012
Display Interface
1020
Network Interface
1016
Processor
1000
User Input Interface
1014
Memory
1010
Mass Storage Device
1018
130

FIG. 10

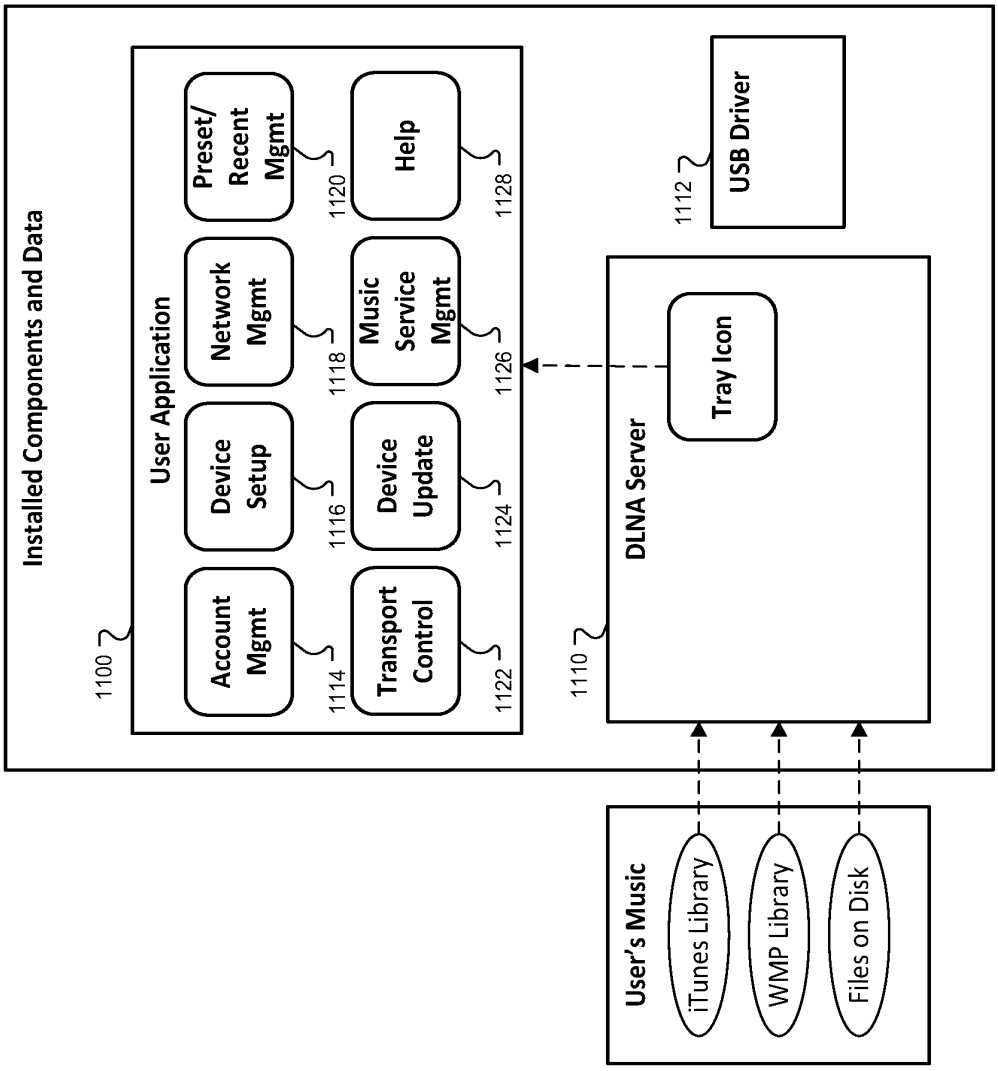

Installed Components and Data
1100
User Application
Account Mgmt
1114
Transport Control
1122
Device Setup
1116
Device Update
1124
Network Mgmt
1118
Music Service Mgmt
1126
Preset/ Recent Mgmt
1120
Help
1128
1110
DLNA Server
Tray Icon
1112
USB Driver
User's Music
iTunes Library
WMP Library
Files on Disk

FIG. 11

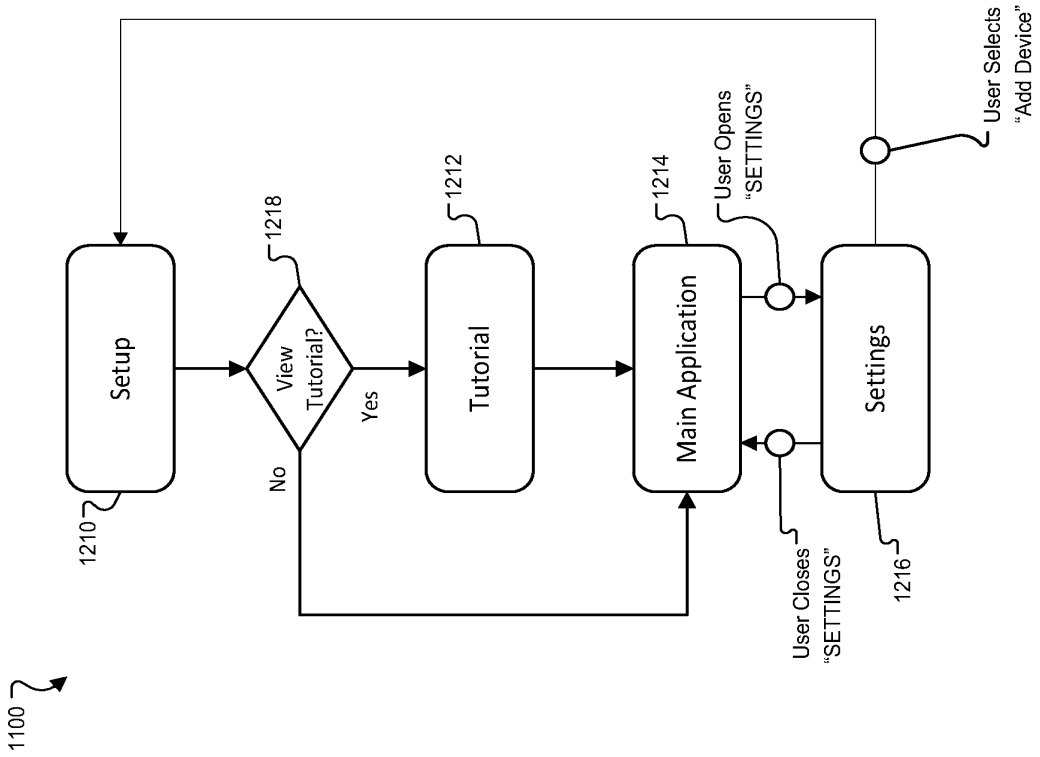

1100
Setup
1210
View Tutorial?
1218
Yes
No
Tutorial
1212
Main Application
1214
User Opens "SETTINGS"
User Closes "SETTINGS"
Settings
1216
User Selects "Add Device"

FIG. 12

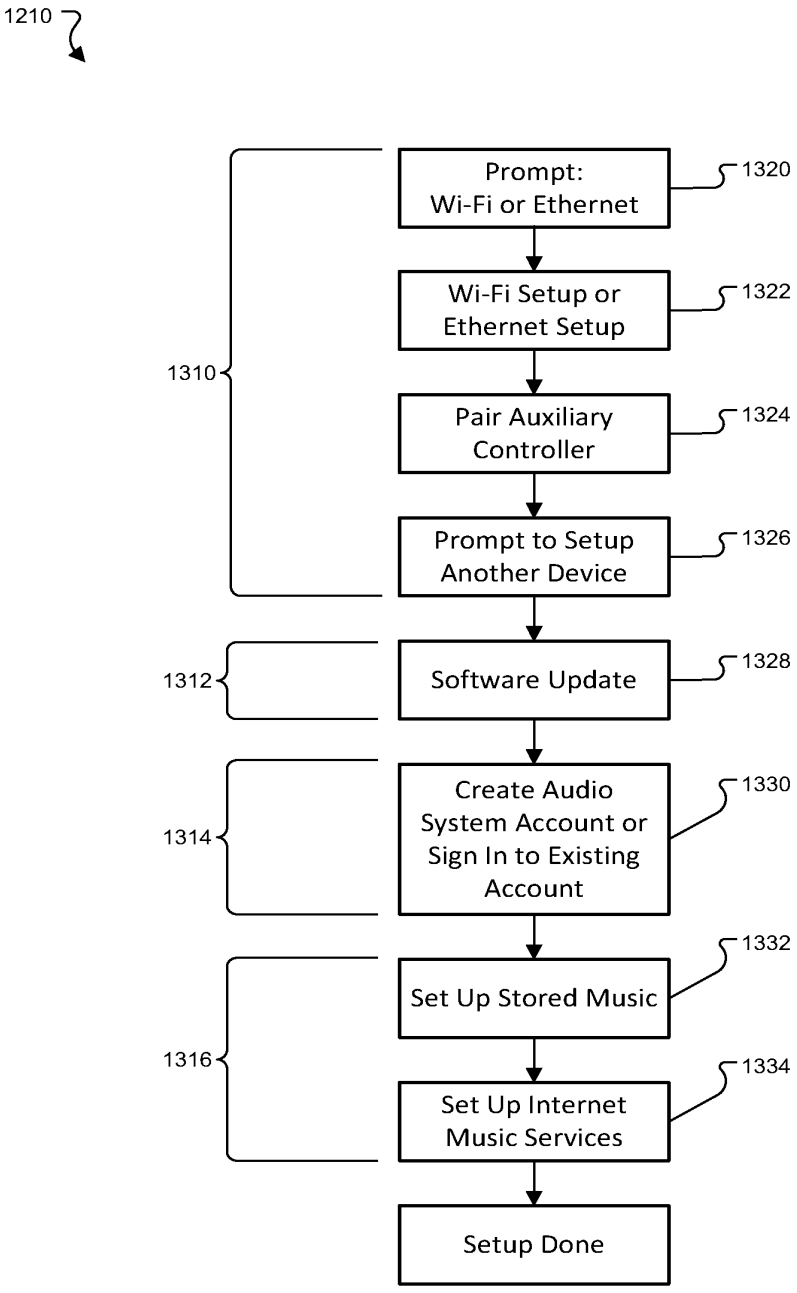

1210
Prompt: Wi-Fi or Ethernet
1320
Wi-Fi Setup or Ethernet Setup
1322
1310
Pair Auxiliary Controller
1324
Prompt to Setup Another Device
1326
1312
Software Update
1328
1314
Create Audio System Account or Sign In to Existing Account
1330
1332
Set Up Stored Music
1316
1334
Set Up Internet Music Services
Setup Done

FIG. 13

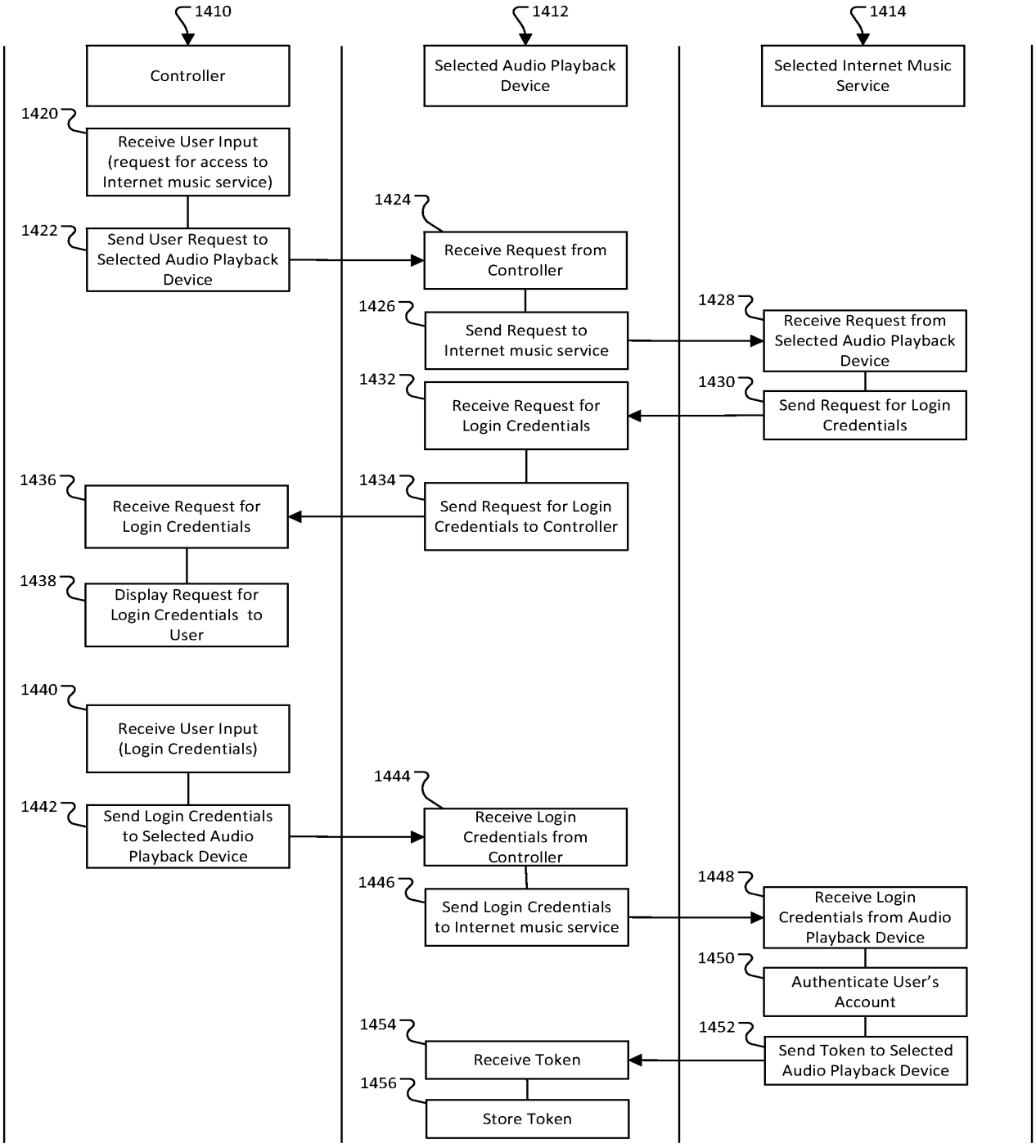

1410
1412
1414
Controller
Selected Audio Playback Device
Selected Internet Music Service
1420
Receive User Input (request for access to Internet music service)
1422
Send User Request to Selected Audio Playback Device
1424
Receive Request from Controller
1426
Send Request to Internet music service
1428
Receive Request from Selected Audio Playback Device
1430
Send Request for Login Credentials
1432
Receive Request for Login Credentials
1434
Send Request for Login Credentials to Controller
1436
Receive Request for Login Credentials
1438
Display Request for Login Credentials to User
1440
Receive User Input (Login Credentials)
1442
Send Login Credentials to Selected Audio Playback Device
1444
Receive Login Credentials from Controller
1446
Send Login Credentials to Internet music service
1448
Receive Login Credentials from Audio Playback Device
1450
Authenticate User's Account
1452
Send Token to Selected Audio Playback Device
1454
Receive Token
1456
Store Token

FIG. 14A

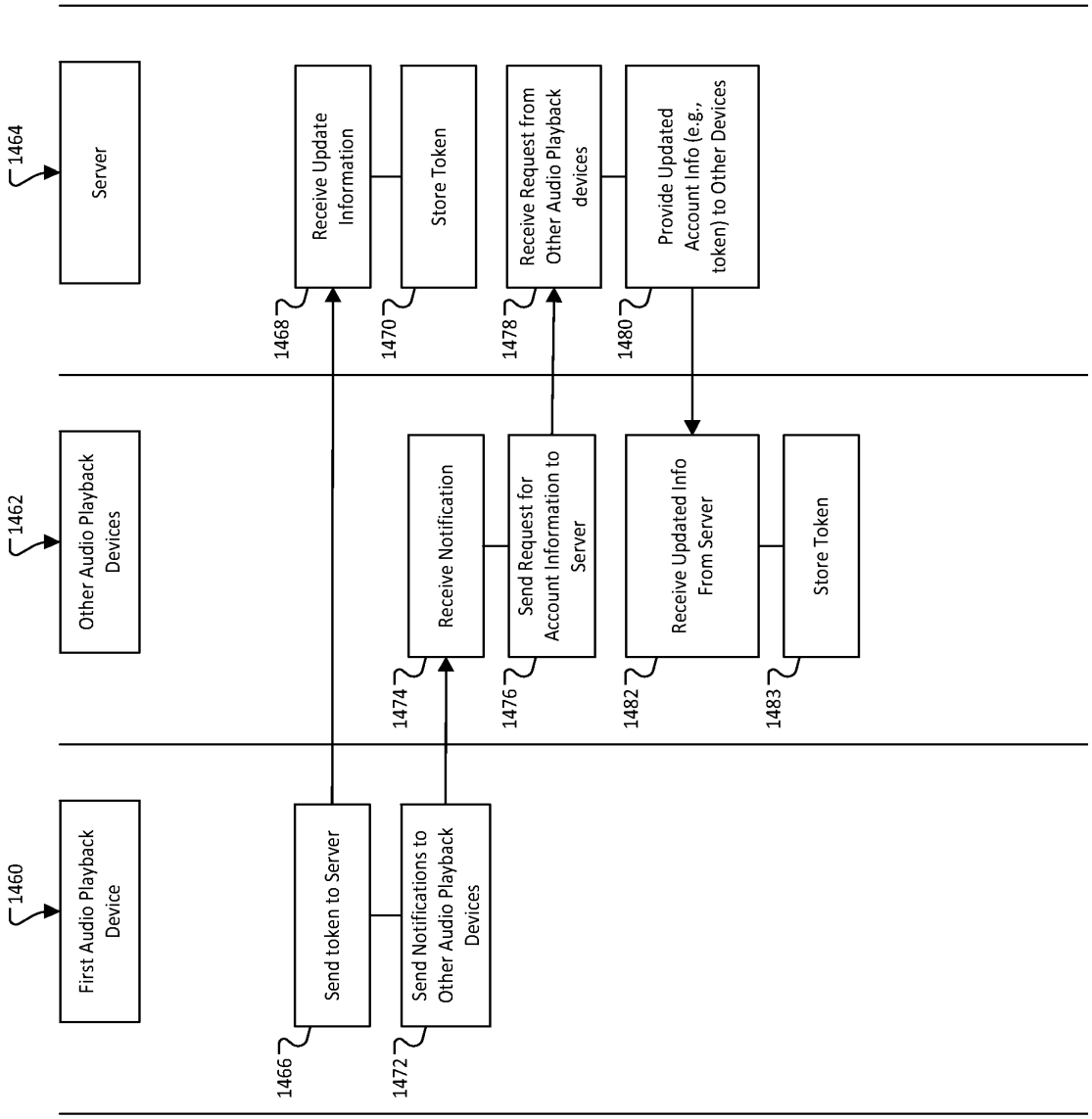

1464
Server
1462
Other Audio Playback Devices
1460
First Audio Playback Device
Receive Update Information
Store Token
Receive Request from Other Audio Playback devices
Provide Updated Account Info (e.g., token) to Other Devices
Receive Notification
Send Request for Account Information to Server
Receive Updated Info From Server
Store Token
Send token to Server
Send Notifications to Other Audio Playback Devices
1468
1470
1478
1480
1474
1476
1482
1483
1466
1472

FIG. 14B

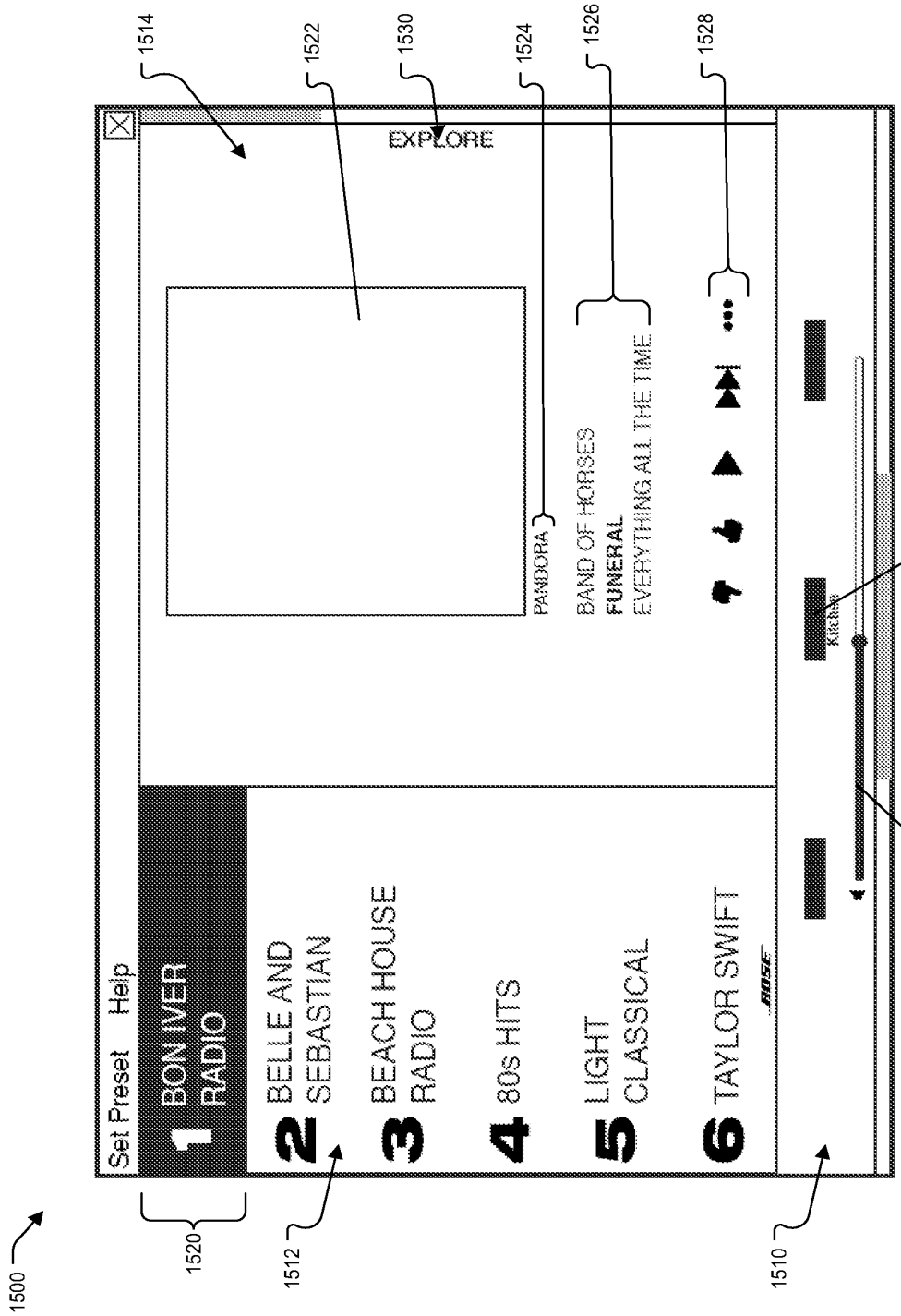

1500
1520
1512
1510
1514
1522
1530
1524
1526
1528
1516
1518
Set Preset Help
1 BON IVER RADIO
2 BELLE AND SEBASTIAN
3 BEACH HOUSE RADIO
4 80s HITS
5 LIGHT CLASSICAL
6 TAYLOR SWIFT
EXPLORE
PANDORA
BAND OF HORSES
FUNERAL
EVERYTHING ALL THE TIME
BOSE

FIG. 15A

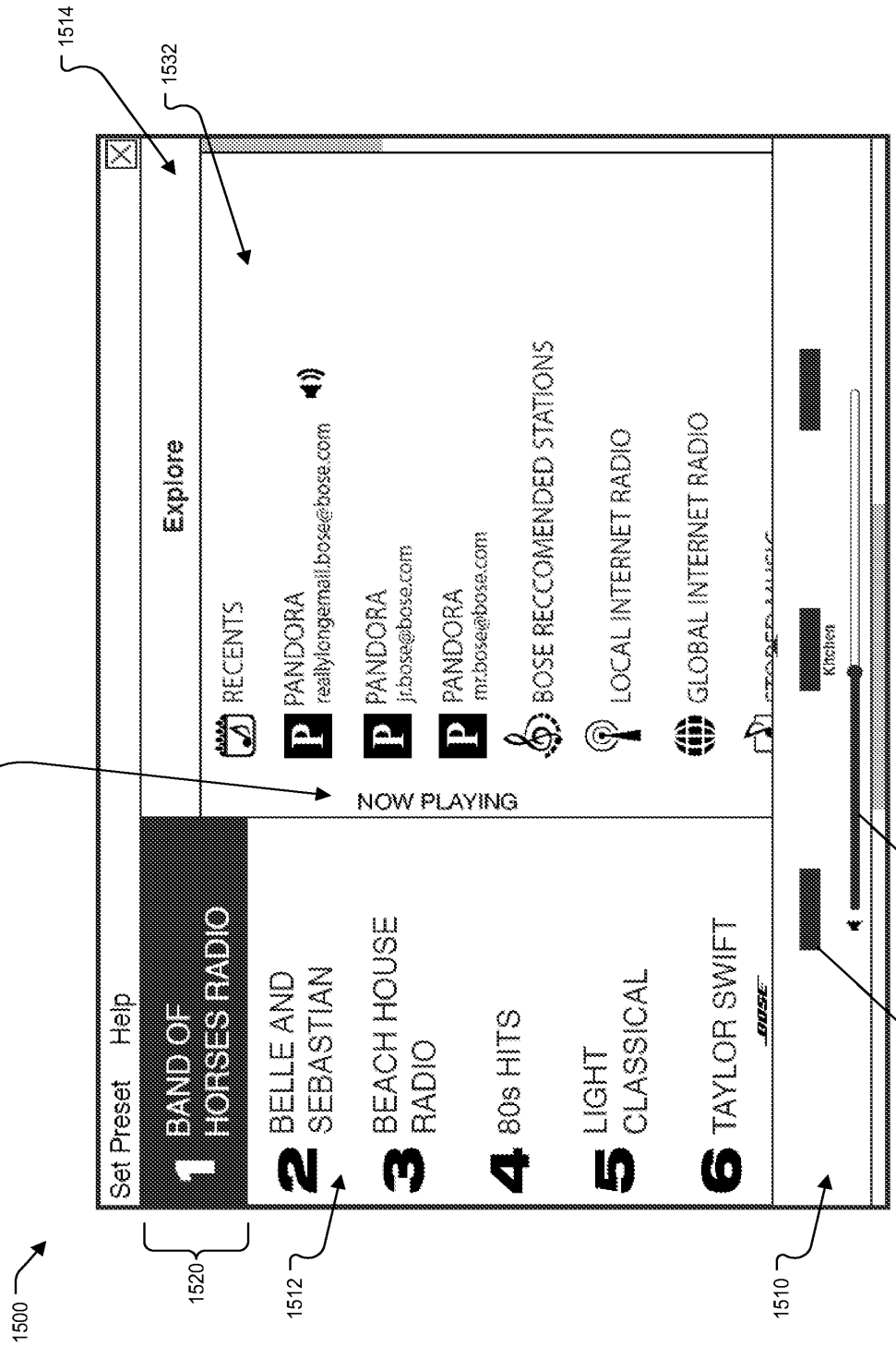

1514
1532
1534
1500
1520
1512
1510
1516
1518
Set Preset
Help
Explore
1 BAND OF HORSES RADIO
2 BELLE AND SEBASTIAN
3 BEACH HOUSE RADIO
4 80s HITS
5 LIGHT CLASSICAL
6 TAYLOR SWIFT
RECENTS
PANDORA
realtylongemail.bose@bose.com
PANDORA
jr.bose@bose.com
PANDORA
mr.bose@bose.com
BOSE RECCOMENDED STATIONS
LOCAL INTERNET RADIO
GLOBAL INTERNET RADIO
NOW PLAYING
Kitchen

FIG. 15B

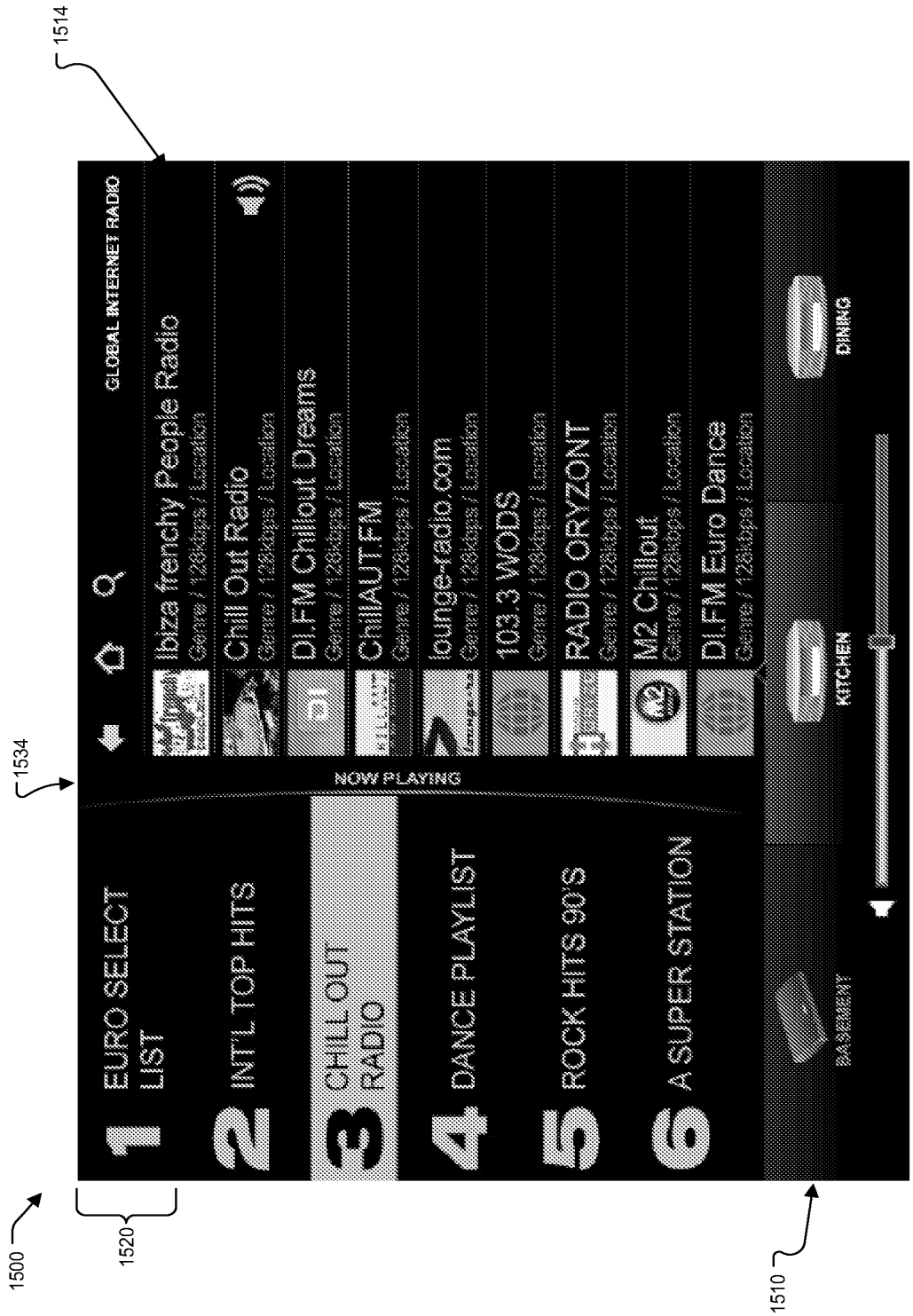

1514
1534
1500
1520
1510
GLOBAL INTERNET RADIO
Ibiza frenchy People Radio
Chill Out Radio
DI.FM Chillout Dreams
ChillAUT FM
lounge-radio.com
103.3 WODS
RADIO ORYZONT
M2 Chillout
DI.FM Euro Dance
NOW PLAYING
1 EURO SELECT LIST
2 INT'L TOP HITS
3 CHILL OUT RADIO
4 DANCE PLAYLIST
5 ROCK HITS 90'S
6 A SUPER STATION
DINING
KITCHEN
BASEMENT

FIG. 15C

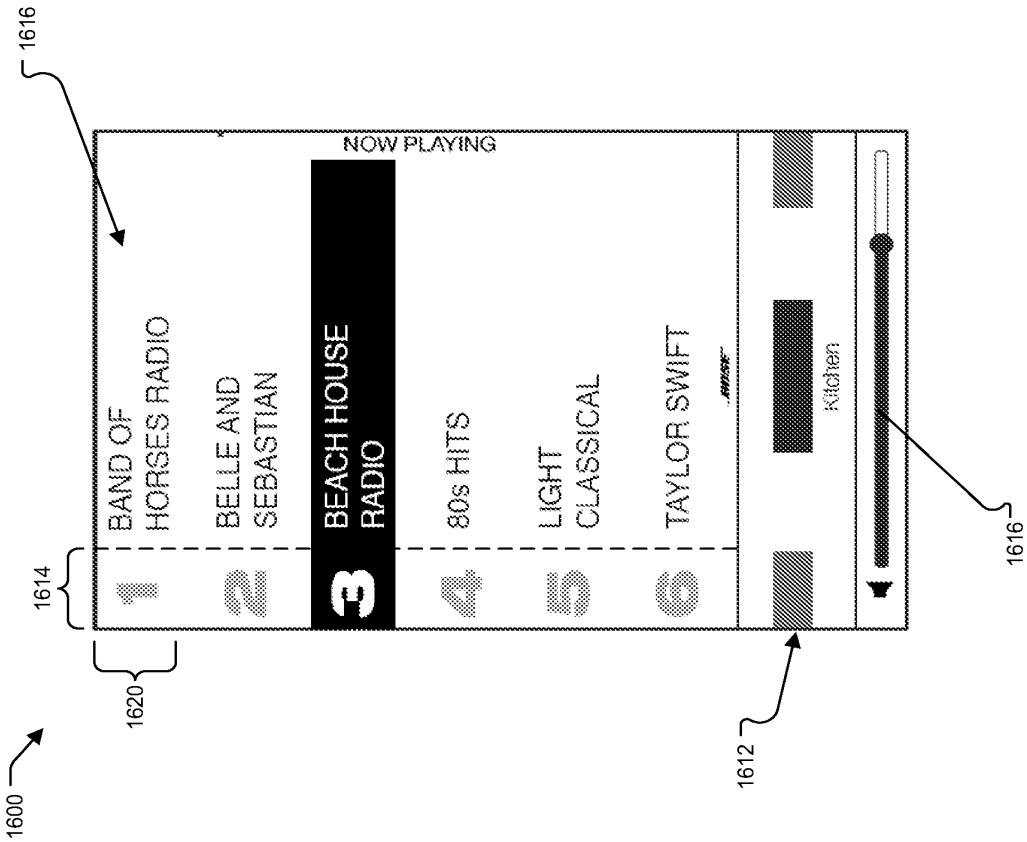

1616
NOW PLAYING
1 BAND OF HORSES RADIO
2 BELLE AND SEBASTIAN
3 BEACH HOUSE RADIO
4 80s HITS
5 LIGHT CLASSICAL
6 TAYLOR SWIFT
Kitchen
1614
1620
1600
1612
1616

FIG. 16A

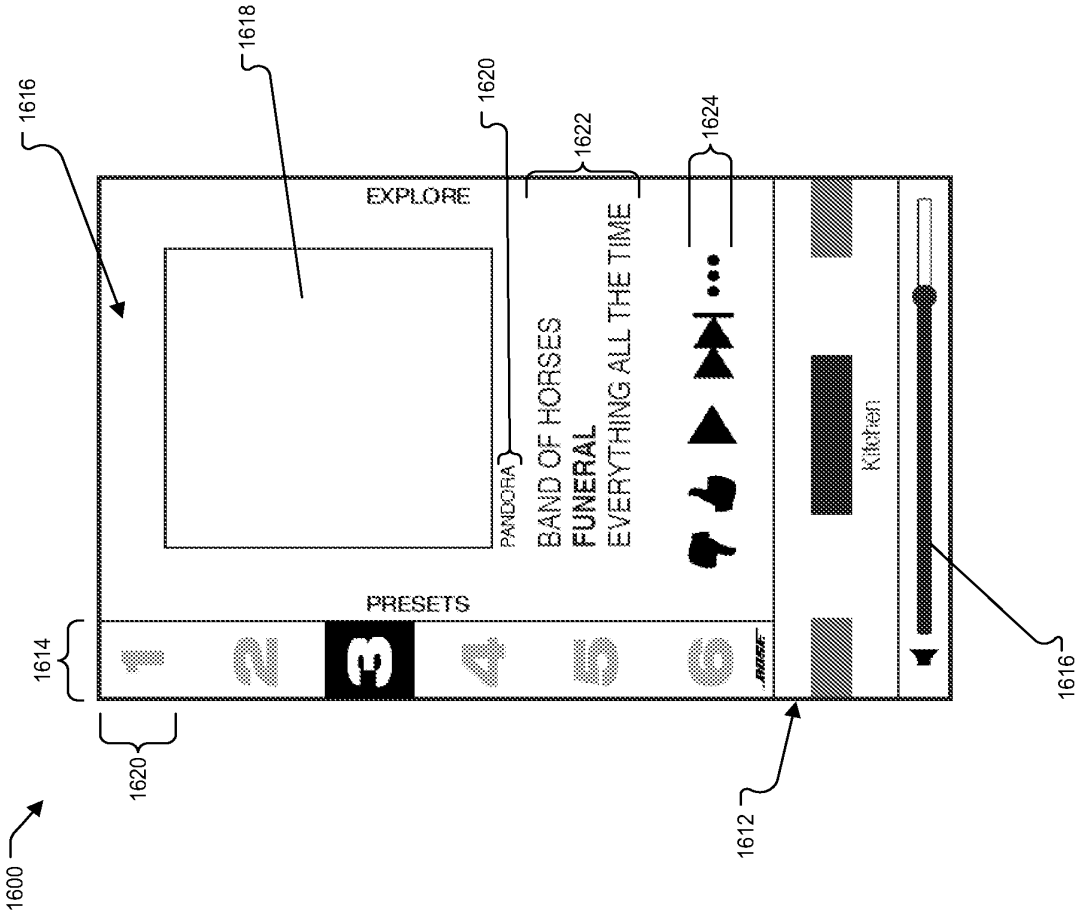

1600
1612
1614
1616
1618
1620
1622
1624
EXPLORE
PANDORA
BAND OF HORSES
FUNERAL
EVERYTHING ALL THE TIME
PRESETS
1
2
3
4
5
6
Kitchen

FIG. 16B

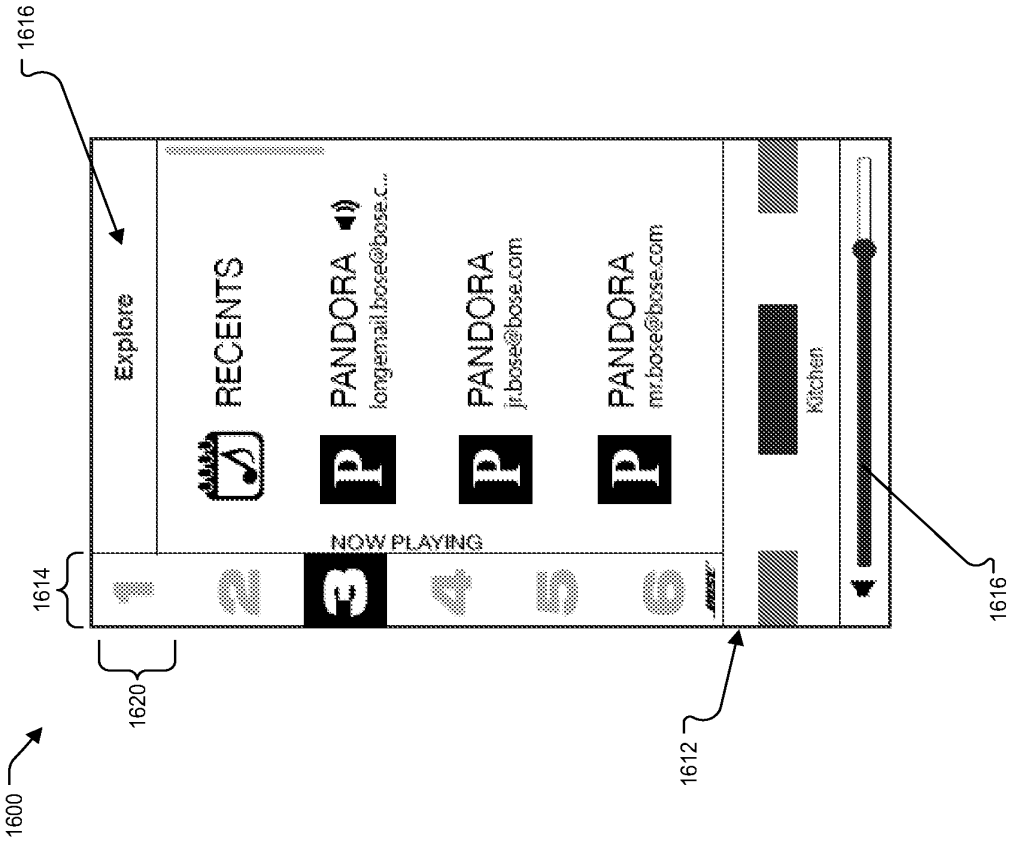

1616
Explore
RECENTS
PANDORA
longemail.bose@bose.c...
PANDORA
jt.bose@bose.com
PANDORA
mr.bose@bose.com
NOW PLAYING
1
2
3
4
5
6
Kitchen
1614
1620
1600
1612
1616

FIG. 16C

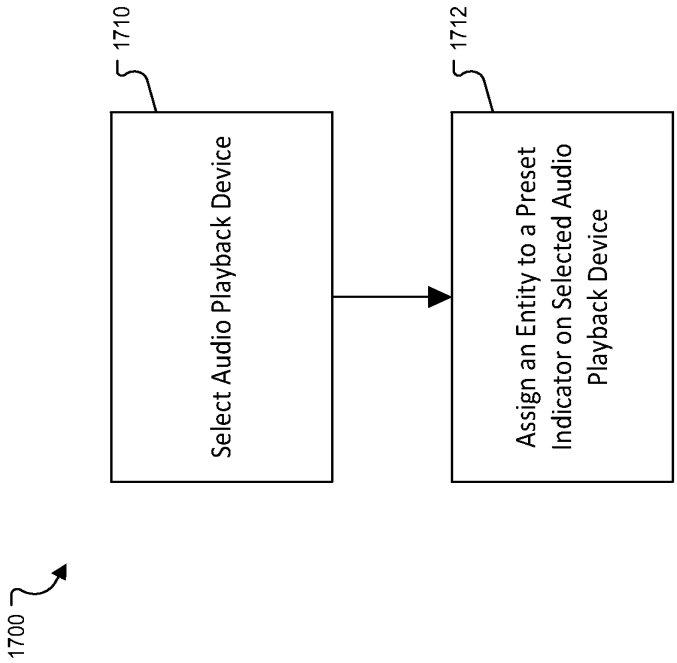

1700
1710
Select Audio Playback Device
1712
Assign an Entity to a Preset Indicator on Selected Audio Playback Device

FIG. 17

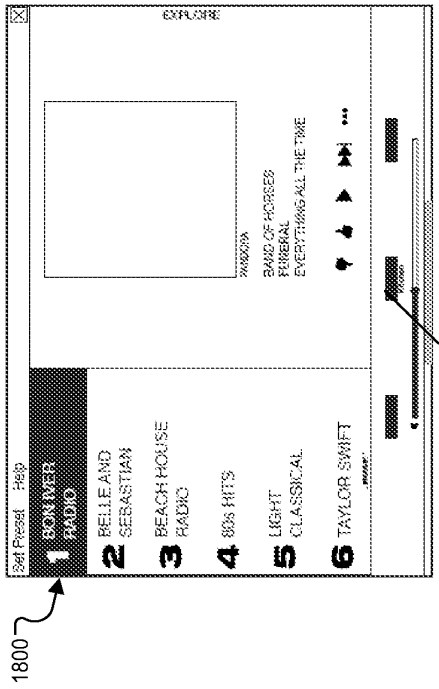



FIG. 18B

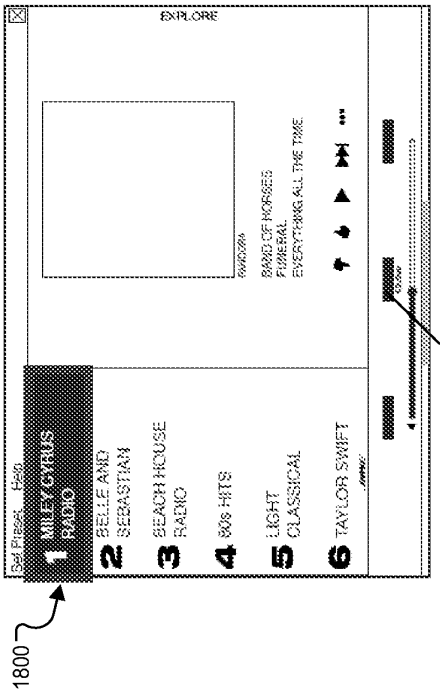



FIG. 18A

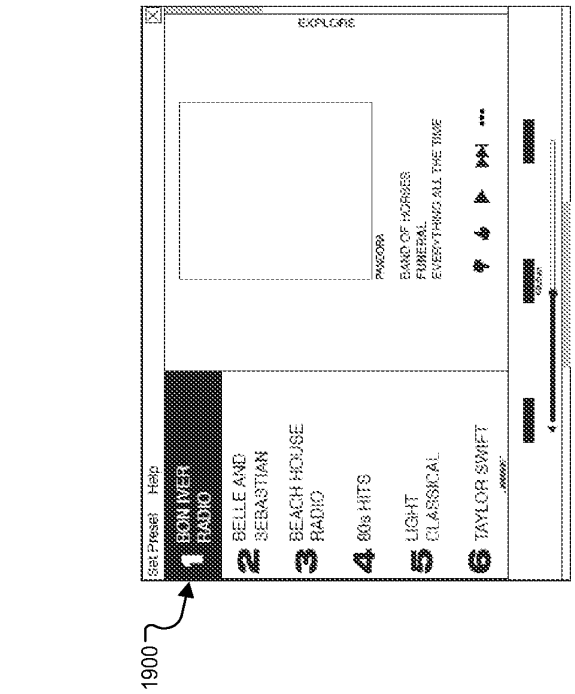



FIG. 19B

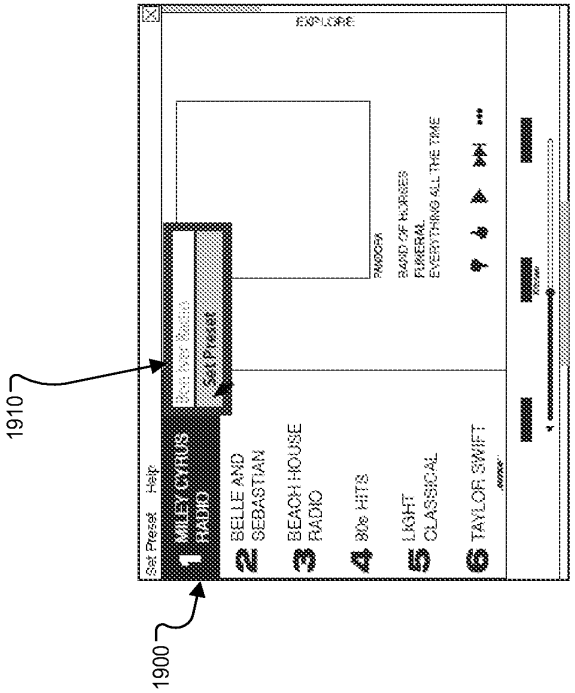



FIG. 19A

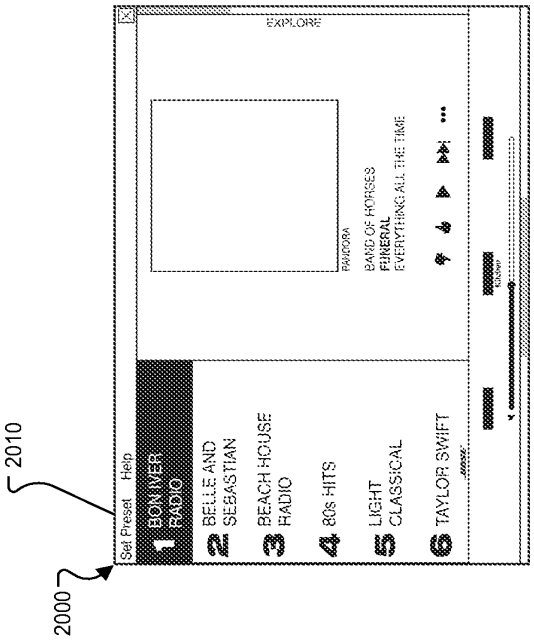



FIG. 20B

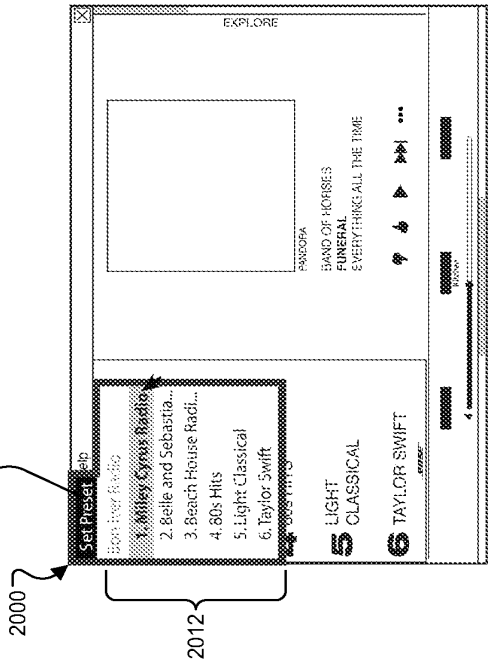



FIG. 20A

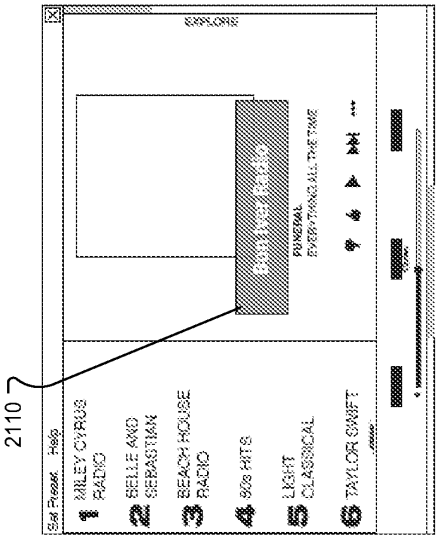



FIG. 21B

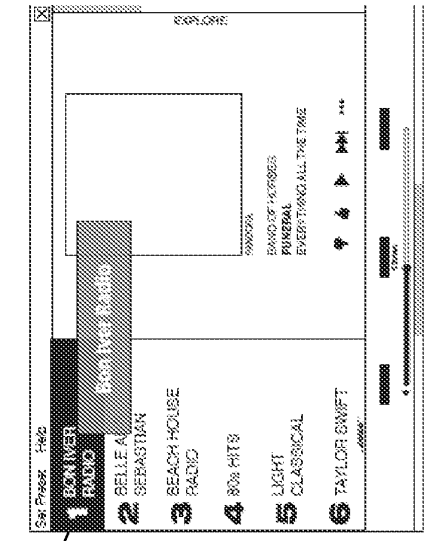



FIG. 21C

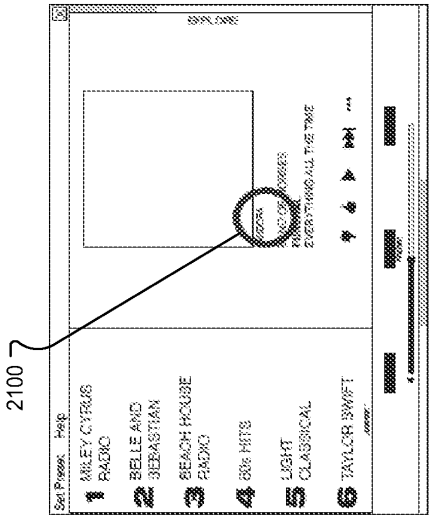



FIG. 21A

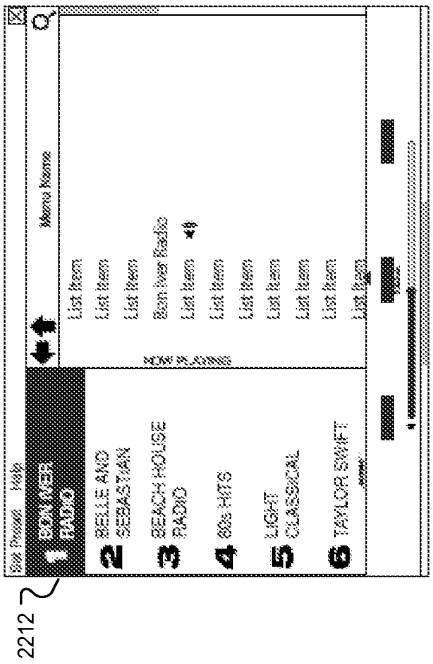



FIG. 22B

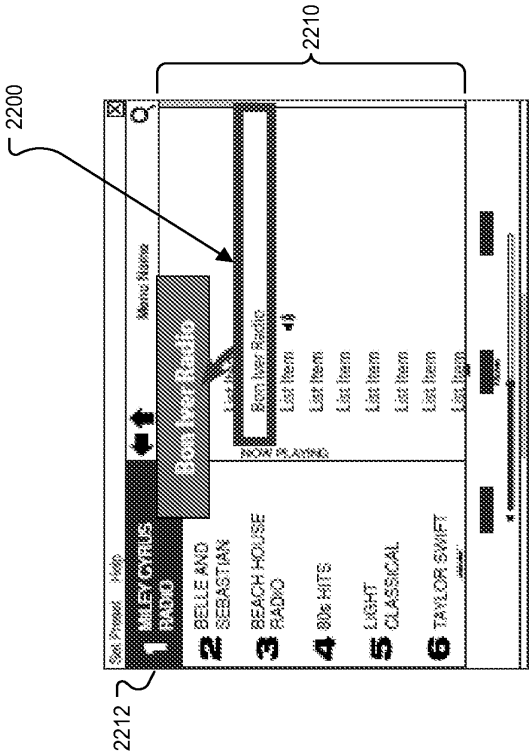



FIG. 22A

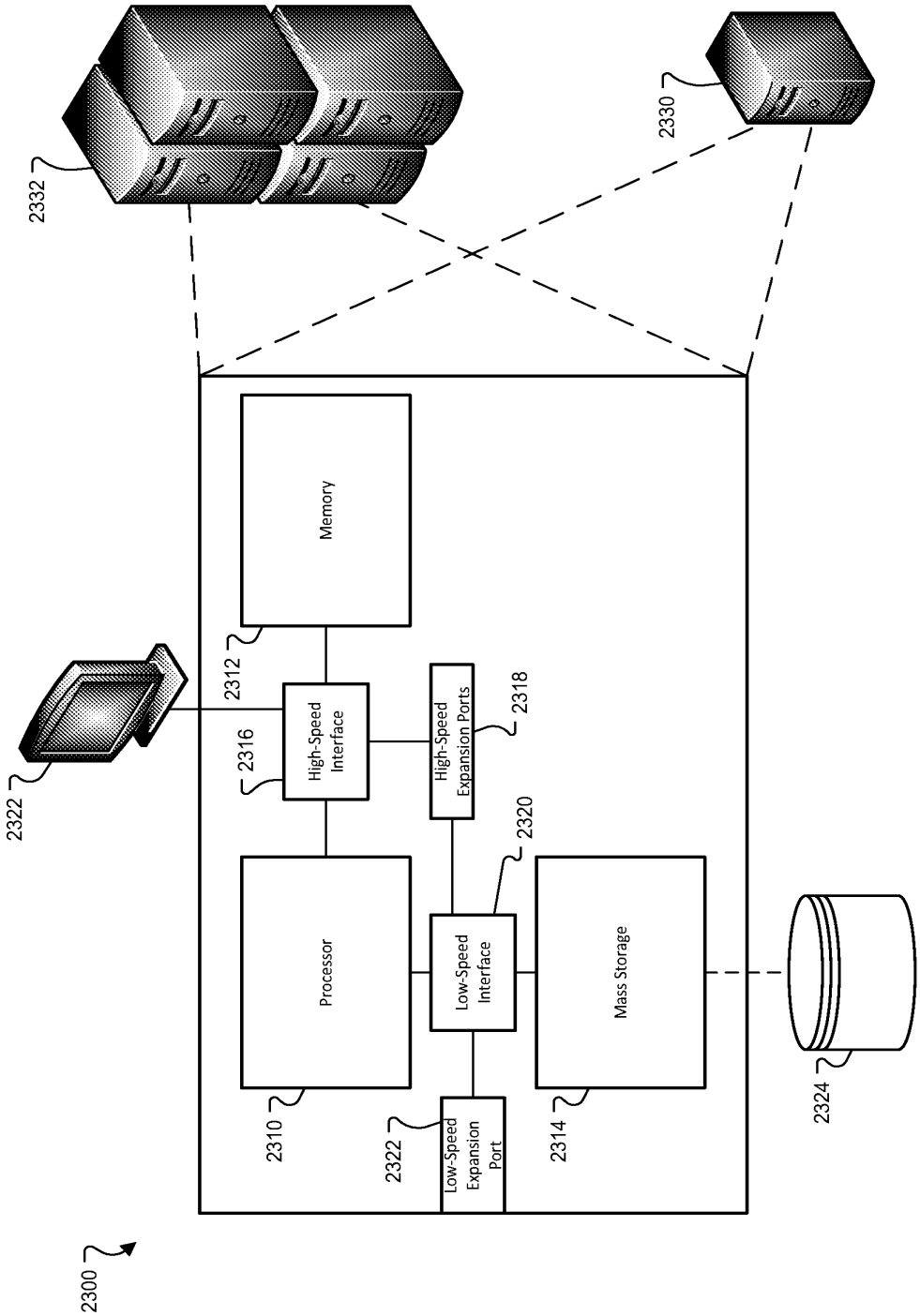

2332
2330
Memory
2312
2316
High-Speed Interface
High-Speed Expansion Ports
2318
2322
2320
Processor
Low-Speed Interface
Mass Storage
2310
2322
Low-Speed Expansion Port
2314
2324
2300

FIG. 23

# Electronic Acknowledgement Receipt

| | |
|---|---|
| **EFS ID:** | 24157435 |
| **Application Number:** | 13864248 |
| **International Application Number:** | |
| **Confirmation Number:** | 5095 |
| **Title of Invention:** | SYSTEM AND METHOD FOR SYNCHRONIZING OPERATIONS AMONG A PLURALITY OF INDEPENDENTLY CLOCKED DIGITAL DATA PROCESSING DEVICES |
| **First Named Inventor/Applicant Name:** | Nicholas A. J. Millington |
| **Customer Number:** | 107361 |
| **Filer:** | Benjamin Michael Urban |
| **Filer Authorized By:** | |
| **Attorney Docket Number:** | 13-0401 (MBHB 15-517-CON) |
| **Receipt Date:** | 23-NOV-2015 |
| **Filing Date:** | 17-APR-2013 |
| **Time Stamp:** | 19:15:29 |
| **Application Type:** | Utility under 35 USC 111(a) |

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| 1 | Information Disclosure Statement (IDS) Form (SB08) | 13-0401_MBHB15-517-CON_IDS.pdf | 1058003<br>3e85c197b47d80cdf0e92877d52fd728540279bf | no | 15 |
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| 4 | Foreign Reference | EP2161950A2.pdf | 438198<br>2055aa8a99d8f8a574f4bbd38868c6446f7d6b3d | no | 10 |
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| 5 | Foreign Reference | EP2591617B1.pdf | 1046822<br>af13974cacabcc4384fbf2614f669a4c46855494 | no | 17 |
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| 6 | Foreign Reference | GB2486183A.pdf | 680286<br>e007f2f1707f277d675a1db46b358fa7a14aa0af | no | 19 |
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| 7 | Foreign Reference | WO2014149533.pdf | 3677125<br>bd4da631ed015fcc74fc3544541f18b0689ac174 | no | 93 |
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| 10 | Non Patent Literature | 13435739_NOA_10-9-15.pdf | 137478<br>468399a2da97d635c6c982ed1e83326394c42660 | no | 4 |

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| 18 | Non Patent Literature | 10861653_Non-Final_OA_6-27-08.pdf | 658074<br>77e5adff5ac294909dd37994d168e6c290dc0ed0 | no | 19 |
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| | Application Number | 13864248 |
| | Filing Date | 2013-04-17 |
| | First Named Inventor | NICHOLAS; A. J. Millington |
| | Art Unit | 2442 |
| | Examiner Name | SURVILLO, OLEG |
| | Attorney Docket Number | 13-0401 |

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| | 1 | 2003169089 | JP | A | 2003-06-13 | ANCL INC., et al. | | ☐ |
| | 2 | 2003506765 | JP | A | 2003-02-18 | | | ☐ |
| | 3 | 0110125 | WO | A1 | 2001-02-08 | CHUNG RANDALL M [US] | | ☐ |

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| | Filing Date | 2013-04-17 |
| | First Named Inventor | NICHOLAS; A. J. Millington |
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| | 2 | "Notice of Allowance mailed on 21 September 2015, issued in connection with U.S. Patent Application No. 13/297000, filed on 15 November 2011, 11 pages.". | ☐ |
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| | 4 | "Notice of Allowance mailed on 24 September 2015, issued in connection with U.S. Patent Application No. 13/705174, filed on 5 December 2012, 7 pages.". | ☐ |
| | 5 | "Notice of Allowance mailed on 24 September 2015, issued in connection with U.S. Patent Application No. 14/184935, filed on 20 February 2014, 7 pages". | ☐ |
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| | 7 | "Notice of Allowance mailed on 27 August 2015, issued in connection with U.S. Patent Application No. 14/505027, filed on 2 October 2014, 18 pages.". | ☐ |
| | 8 | "Notice of Allowance mailed on 3 September 2015, issued in connection with U.S. Patent Application No. 13/705174, filed on 5 December 2012, 4 pages.". | ☐ |
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|---|---|---|
| | Application Number | 13864248 |
| | Filing Date | 2013-04-17 |
| | First Named Inventor | NICHOLAS; A. J. Millington |
| | Art Unit | 2442 |
| | Examiner Name | SURVILLO, OLEG |
| | Attorney Docket Number | 13-0401 |

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|---|---|---|
| | Application Number | 13864248 |
| | Filing Date | 2013-04-17 |
| | First Named Inventor | NICHOLAS; A. J. Millington |
| | Art Unit | 2442 |
| | Examiner Name | SURVILLO, OLEG |
| | Attorney Docket Number | 13-0401 |

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| Name/Print | Benjamin M. Urban | Registration Number | 71,591 |

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| **EFS ID:** | 23741667 |
| **Application Number:** | 13864248 |
| **International Application Number:** | |
| **Confirmation Number:** | 5095 |
| **Title of Invention:** | SYSTEM AND METHOD FOR SYNCHRONIZING OPERATIONS AMONG A PLURALITY OF INDEPENDENTLY CLOCKED DIGITAL DATA PROCESSING DEVICES |
| **First Named Inventor/Applicant Name:** | Nicholas A. J. Millington |
| **Customer Number:** | 107361 |
| **Filer:** | Benjamin Michael Urban |
| **Filer Authorized By:** | |
| **Attorney Docket Number:** | 13-0401 (MBHB 15-517-CON) |
| **Receipt Date:** | 09-OCT-2015 |
| **Filing Date:** | 17-APR-2013 |
| **Time Stamp:** | 14:27:52 |
| **Application Type:** | Utility under 35 USC 111(a) |

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| 3 | Foreign Reference | WO0110125A1.pdf | 1576645<br>b65f9570bb587ec501b672b075480c4fd45448b5 | no | 38 |
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Espacenet

## Bibliographic data: JP2003169089 (A) — 2003-06-13

# STREAM DATA DECENTRALIZED DISTRIBUTION METHOD AND ITS SYSTEM

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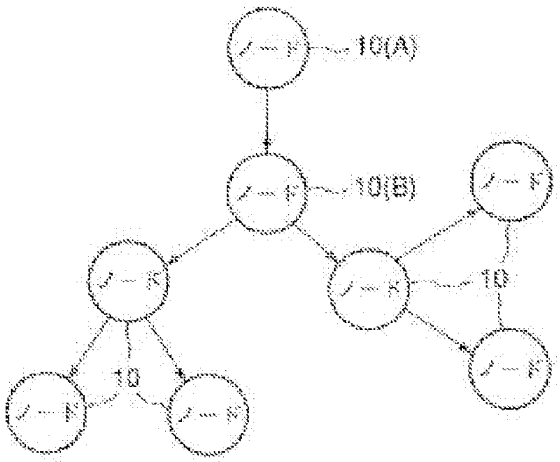
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## Abstract of JP2003169089 (A)

PROBLEM TO BE SOLVED: To provide a stream data decentralized distribution technique which can actualize autonomous or personal stream data distribution in network environment such as the Internet, specially, between user terminals. ;SOLUTION: The stream data decentralized distribution system is actualized which allows nodes 10 to mutually send and receive stream data in the network environment such as the Internet. Each node 10 exchanges topology information showing connection relation between upstream and downstream nodes and relays stream data from the upstream node to the downstream node. Each node 10 is optionally disconnected from the network and connected to the upstream node under a predetermined condition. ;COPYRIGHT: (C)2003,JPO


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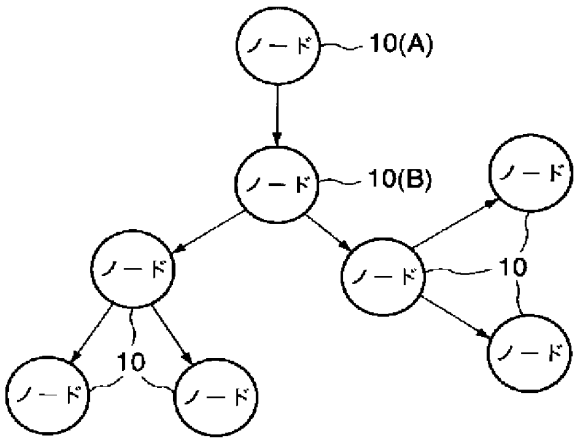
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最終頁に続く

(54)【発明の名称】　ストリームデータ分散配信方法及びそのシステム

(57)【要約】
【課題】インターネットなどのネットワーク環境において、特にユーザ端末間での自律的又は個人的なストリームデータ配信を実現できるストリームデータ分散配信技術を提供することにある。
【解決手段】インターネットなどのネットワーク環境において、各ノード１０間でストリームデータの送受信を行なうストリームデータ分散配信システムを実現する。各ノード１０は、上流ノードと下流ノードとの接続関係を示すトポロジ情報を交換し、上流ノードから下流ノードへストリームデータを中継する。各ノード１０は、任意にネットワークから離脱し、かつ所定の条件に従って上流ノードに対して接続する。



【特許請求の範囲】
【請求項１】　各ノードが相互接続して構築されるネットワークにおいて、各ノード間でストリームデータの送受信を実行するストリームデータ分散配信機能を実現する方法であって、
前記各ノードは、上流ノードと下流ノードとの接続関係を認識するためのトポロジ情報を管理するトポロジ管理手段、当該トポロジ情報をノード間で交換する手段、及び前記ストリームデータの送受信手段を有し、
上流ノード又は下流ノードとの接続を実行するステップと、
接続した上流ノード又は下流ノードとの間で前記トポロジ情報を交換するステップと、
上流ノードとして動作する場合に、前記トポロジ情報に基づいて認識される下流ノードに対して前記ストリームデータを送信するステップとから構成されるストリームデータ分散配信方法。
【請求項２】　前記トポロジ管理手段は、
自ノードとの接続関係を認識するための上流ノード又は下流ノードの識別情報を含む前記トポロジ情報を登録する機能と、
前記接続関係の変更に応じて前記トポロジ情報を更新する機能と、
前記トポロジ情報を下流ノードに提供する機能とを実現するように構成されていることを特徴とする請求項１に記載のストリームデータ分散配信方法。
【請求項３】　下流ノードとして動作する場合に、前記トポロジ情報に基づいて認識される上流ノードから送信されたストリームデータを受信するステップを更に有することを特徴とする請求項１または請求項２のいずれか１項に記載のストリームデータ分散配信方法。
【請求項４】　前記トポロジ情報に基づいて認識される上流ノードから送信されたストリームデータを受信し、かつ前記トポロジ情報に基づいて認識される下流ノードに対して当該ストリームデータを送信する中継機能を実現するステップを更に有することを特徴とする請求項１から請求項３のいずれか１項に記載のストリームデータ分散配信方法。
【請求項５】　新たな上流ノードまたは下流ノードとの接続確立あるいは既存の上流ノードまたは下流ノードとの接続切断に応じて、前記トポロジ管理手段は前記トポロジ情報を更新するステップを更に有することを特徴とする請求項１から請求項４のいずれか１項に記載のストリームデータ分散配信方法。
【請求項６】　既存の上流ノードとの接続を切断して、新たな上流ノードとの接続を確立するステップと、
前記接続確立ステップによる接続確立に応じて、前記更新ステップにより更新された前記トポロジ情報により認識される上流ノードから送信されたストリームデータを受信するステップと、
前記トポロジ情報により認識される下流ノードが存在する場合に、前記受信ステップにより受信したストリームデータを当該下流ノードに送信するステップとを更に有することを特徴とする請求項１から請求項５のいずれか１項に記載のストリームデータ分散配信方法。
【請求項７】　ストリームデータを配信するサーバを上流ノードとして、当該上流ノードから送信されたストリームデータを受信するステップと、
前記受信ステップにより受信したストリームデータを、前記トポロジ情報に基づいて認識される下流ノードに対して中継するステップとを更に有することを特徴とする請求項１から請求項６のいずれか１項に記載のストリームデータ分散配信方法。
【請求項８】　インターネット上で、前記ネットワークに接続された複数の上流ノードを登録して、前記各ノードに対して紹介するサーバが設けられて、
下流ノードとして、前記サーバから接続可能な上流ノードの紹介を受けるステップと、
前記サーバから紹介された上流ノードに対して接続要求を実行するステップと、
前記接続要求に応じて接続許可された上流ノードに接続するステップとを更に有することを特徴とする請求項１から請求項７のいずれか１項に記載のストリームデータ分散配信方法。
【請求項９】　前記上流ノードに接続するステップの後に、自ノードを前記サーバに登録するステップを更に有することを特徴とする請求項８に記載のストリームデータ分散配信方法。
【請求項１０】　下流ノードからの接続要求に応じて接続認証処理を実行するステップと、
前記接続認証処理ステップでの処理結果が接続許可の場合には、当該下流ノードとの間で通信するステップとを更に有することを特徴とする請求項１から請求項９のいずれか１項に記載のストリームデータ分散配信方法。
【請求項１１】　受信した前記ストリームデータを再生するステップを更に有することを特徴とする請求項１から請求項１０のいずれか１項に記載のストリームデータ分散配信方法。
【請求項１２】　各ノードが相互接続して構築されるネットワークにおいて、各ノード間でストリームデータの送受信を実行して、ストリームデータ分散配信機能を実現するためのプログラムであって、
前記各ノードは、前記プログラムを実行するコンピュータを有し、
上流ノードと下流ノードとの接続関係を認識するためのトポロジ情報の登録、更新、提供の各機能を含む管理機能と、
上流ノード又は下流ノードとの接続を実行する機能と、
接続した上流ノード又は下流ノードとの間で前記トポロジ情報を交換する機能と、

上流ノードとして動作する場合に、前記トポロジ情報に基づいて認識される下流ノードに対して前記ストリームデータを送信又は中継する機能とを前記コンピュータに実現させるためのプログラム。

【請求項１３】　下流ノードとして動作する場合に、前記トポロジ情報に基づいて認識される上流ノードから送信されたストリームデータを受信する機能と、
受信した前記ストリームデータを再生する機能とを前記コンピュータに実現させることを特徴とする請求項１２に記載のプログラム。

【請求項１４】　新たな上流ノードまたは下流ノードとの接続確立あるいは既存の上流ノードまたは下流ノードとの接続切断に応じて、前記トポロジ情報を更新する機能を前記コンピュータに実現させることを特徴とする請求項１２または請求項１３のいずれか１項に記載のプログラム。

【請求項１５】　下流ノードからの接続要求に応じて接続認証処理を実行する機能と、
前記接続認証処理の結果が接続許可の場合には、当該下流ノードとの間で通信する機能とを前記コンピュータに実現させることを特徴とする請求項１２から請求項１４のいずれか１項に記載のプログラム。

【請求項１６】　受信した前記ストリームデータを再生する機能とを前記コンピュータに実現させることを特徴とする請求項１２から請求項１５のいずれか１項に記載のプログラム。

【請求項１７】　各ノードが相互接続して構築されるネットワークにおいて、各ノード間でストリームデータの送受信を実行するストリームデータ分散配信機能を実現するシステムであって、
前記各ノードは、
上流ノード又は下流ノードとの接続の確立または切断を実行する手段と、
上流ノードと下流ノードとの接続関係を認識するためのトポロジ情報を管理するトポロジ管理手段と、
接続した上流ノード又は下流ノードとの間で前記トポロジ情報を交換する手段と、
上流ノードとして動作する場合に、前記トポロジ情報に基づいて認識される下流ノードに対して前記ストリームデータを送信する手段とを具備したことを特徴とするストリームデータ分散配信システム。

【請求項１８】　前記トポロジ管理手段は、
自ノードとの接続関係を認識するための上流ノード又は下流ノードの識別情報を含む前記トポロジ情報を登録する手段と、
新たな上流ノードまたは下流ノードとの接続確立あるいは既存の上流ノードまたは下流ノードとの接続切断による前記接続関係の変更に応じて前記トポロジ情報を更新する手段と、
前記トポロジ情報を下流ノードに提供する手段とを含むことを特徴とする請求項１７に記載のストリームデータ分散配信システム。

【請求項１９】　下流ノードとして動作する場合に、前記トポロジ情報に基づいて認識される上流ノードから送信されたストリームデータを受信する手段と、
前記トポロジ情報に基づいて認識される下流ノードが存在する場合に、前記受信手段により受信したストリームデータを当該下流ノードに送信する中継手段とを更に有することを特徴とする請求項１７または請求項１８のいずれか１項に記載のストリームデータ分散配信システム。

【請求項２０】　前記各ノードは、
下流ノードからの接続要求に応じて接続認証処理を実行する手段と、
接続許可の場合には当該下流ノードと接続する手段と、
接続拒否の場合には接続拒否を示すメッセージを当該下流ノードに送信する手段とを有することを特徴とする請求項１７から請求項１９のいずれか１項に記載のストリームデータ分散配信システム。

【請求項２１】　前記受信手段は、
既存の上流ノードとの接続を切断して、新たな上流ノードとの接続確立に応じて、前記トポロジ管理手段により更新された前記トポロジ情報により認識される上流ノードから送信されたストリームデータを受信し、
前記中継手段は、
前記トポロジ情報により認識される下流ノードが存在する場合に、前記受信手段により受信したストリームデータを当該下流ノードに送信することを特徴とする請求項１９に記載のストリームデータ分散配信システム。

【請求項２２】　前記各ノードは、受信した前記ストリームデータを再生する手段を更に有することを特徴とする請求項１７から請求項２１のいずれか１項に記載のストリームデータ分散配信システム。

【発明の詳細な説明】

【０００１】

【発明の属する技術分野】本発明は、一般的にはネットワーク環境下でストリームデータを分散配信する方法に関し、特にインターネット上においてユーザ端末間でストリームデータの分散配信機能を実現する技術に関する。

【０００２】

【従来の技術】近年、インターネットを代表とする情報通信ネットワーク環境において、ブロードバンド化の推進により、主として動画（映像）や音声のコンテンツ情報（以下ストリームデータと呼ぶ場合がある）の伝送を容易に行なうことが可能になりつつある。ブロードバンド化のネットワーク環境としては、例えばＡＤＳＬ（asymmetric digital subscriber line）伝送方式やＣＡＴＶ（cable television）ネットワークを利用した有線通信方式以外に、携帯電話などの無線通信方式（移動体通

信方式）によるネットワーク環境も含まれる。

【０００３】ところで、インターネットに接続されるユーザ端末としては、パーソナルコンピュータ、各種のディジタル情報機器（例えばディジタル・テレビ受信機など）、携帯電話（ＰＨＳも含む）、あるいは無線通信機能を有する携帯型情報端末（ＰＤＡ：personal digital assistantとも呼ばれている）等が含まれる。

【０００４】ブロードバンド化のネットワーク環境下で、これらのユーザ端末を使用することにより、ストリームデータを受信して、ユーザの違和感を伴なうことなく、動画や音声のコンテンツ情報を再生することが可能となる。従来では、インターネットによる情報サービスや、個人間の情報交換では、文字情報や静止画像が主体であり、動画や音声などのストリームデータの通信は限定されたものであった。従って、今後、ブロードバンド化のネットワーク環境の普及に伴なって、ストリームデータ配信サービス事業などのビジネス分野だけでなく、ユーザ間で個人的情報を交換するプライベートの分野でも、ストリームデータ配信に対する需要が増大することが予想される。

【０００５】

【発明が解決しようとする課題】ネットワーク環境下でのブロードバンド化の推進により、インターネットの基幹系や、各家庭のユーザ端末と接続する支線系について、帯域の増強や通信コストの低減化が実現されつつある。

【０００６】しかし一方で、ストリームデータ配信に対する需要の増大化に伴なって、ストリームデータを送信するためのシステムに対して、負荷容量（配信能力）の増大化が要求されている。このことは、特にサーバを中心とする多大な設備投資が要求されて、システム構築に要するコストの増大化を招くことになる。

【０００７】一般的に、ストリームデータの配信システムは、サービス事業者（インターネットサービスプロバイダ：ＩＳＰなど）が管理するサーバにより実現されている。従って、サービス事業者側において、コスト面からサーバの負荷容量を増強できない場合、ストリームデータ配信に対する需要の増大化に対応できず、ブロードバンド化により増強されたインターネットの帯域を十分に活用できない状況になる。

【０００８】このような問題点を解消するために、ストリームデータを分散配信（配送）する各種の技術が開発されている。これらの先行技術により、ストリームデータの送信（配信）を行なうサーバの負荷を軽減することが可能となる。しかしながら、いずれの先行技術も基本的には、分散配信システムを事業者が管理するサーバにより中央制御する方式である。このため、ストリームデータの送信に関するサーバの負荷は軽減できても、一方で、分散配信システムを構成するためのトポロジ（ノード間の接続関係）の制御などに関するサーバの負荷が増大するという問題がある。

【０００９】さらに、分散配信システムを中央制御する方式は、サービス事業者が管理するサーバによりストリームデータ配信を行なう事業者向けのアプローチである。換言すれば、ユーザ間で個人的情報を交換するプライベートの分野において、サービス事業者が管理するサーバを要することなく、いわば自律的又は個人的なストリームデータ配信を実現する分散配信システムに関する技術は開発されていない。

【００１０】そこで、本発明の目的は、インターネットなどのネットワーク環境において、特にユーザ端末間での自律的又は個人的なストリームデータ配信を実現できるストリームデータ分散配信技術を提供することにある。

【００１１】

【課題を解決するための手段】本発明の観点は、インターネットなどのネットワーク環境において、各ユーザ端末（ノード）間でストリームデータの送受信を行なうストリームデータ分散配信システムを動的に構築するための方法に関する。本方法の特徴は、各ユーザ端末のネットワーク接続関係を認識するためのトポロジ情報を、各ノード（ユーザ端末）が分散管理する構成にある。換言すれば、各ノードが自律的に、トポロジ情報を記憶し、更新し、提供するなどの管理を行なう機能を備えている。

【００１２】本発明の観点によるストリームデータ分散配信方法は、各ノードが相互接続して構築されるネットワークにおいて、各ノード間でストリームデータの送受信を実行して、ストリームデータ分散配信機能を実現する方法であって、各ノードは、上流ノードと下流ノードとの接続関係を認識するためのトポロジ情報を管理する手段、当該トポロジ情報をノード間で交換する手段、及び前記ストリームデータの送受信手段を有し、上流ノード又は下流ノードとの接続を実行するステップと、接続した上流ノード又は下流ノードとの間でトポロジ情報を交換するステップと、上流ノードとして動作する場合に、トポロジ情報に基づいて認識される下流ノードに対して前記ストリームデータを送信するステップとから構成されている。

【００１３】本発明の観点によるストリームデータ分散配信方法であれば、サービス事業者が管理するストリームデータ配信用サーバや、分散配送系制御サーバなどを要することなく、例えばインターネットに接続されたユーザ端末間で、ストリームデータの送信、受信または中継を行なうことができる。

【００１４】各ノードは、トポロジ情報により認識した上流ノードに接続し、当該上流ノードから送信されるストリームデータを受信できる。また、トポロジ情報により認識した下流ノードに対してストリームデータを送信できる。この場合、上流ノードとして機能する自ノード

は、複数の下流ノードに接続し、ストリームデータを同時並行的に送信することができる。また、上流ノードからストリームデータを受信した下流ノードは、他の下流ノードからの接続要求に応じて、上流ノードとして機能し、当該下流ノードに対して受信したストリームデータを送信（要するに中継）することができる。従って、サービス事業者が運営する高性能のストリームデータ配信用サーバを要することなく、インターネットに接続された各ユーザ端末間で、ストリームデータの分散配信を実現することができる。但し、一般的には、各ユーザ端末は、ＩＳＰや通信事業者などを介して、インターネットへの接続を行なうことになる。

【００１５】本発明のストリームデータ分散配信方法を利用すれば、一般ユーザが個人的な撮影映像を、インターネットに接続したパーソナルコンピュータなどを利用して、関係者のみに配信するようなパーソナル放送とも言えるサービスが可能となる。また、ユーザまたは事業者は、多数の視聴者に向けてライブやコンサートなどの中継放送を行なういわゆるインターネット放送を実現できる。この場合、インターネット放送事業者は、商業用のインターネット・ストリームデータ配信サービスにおける配信サーバの負荷を軽減させることができる。即ち、インターネット放送事業者が管理するサーバから、少数の各ユーザ端末にストリームデータを配信し、当該各ユーザ端末から他の各ユーザ端末に対して当該ストリームデータを配信することができる。これにより、インターネット放送事業者が管理するサーバの負荷を、直接的にストリームデータを配信する先のユーザ端末数に応じて軽減することができる。

【００１６】

【発明の実施の形態】以下図面を参照して、本発明の実施の形態を説明する。

【００１７】（システムの基本的構成）図１は、本実施形態に関するストリームデータ分散配信システムの概念を示す図である。

【００１８】本システムは、特にブロードバンドのインターネット等のような常時接続の高速ネットワーク環境を想定し、当該ネットワークに接続された複数のノード１０によりストリームデータを分散配信する構成である。ここで、ストリームデータとは、動画（映像）や音声等の連続的ディジタルデータを意味する。また、ノード１０とは、一般的には、ネットワークに接続されたユーザ端末であるが、サーバやルータなどのネットワーク機器であってもよい。ユーザ端末としては、具体的には、パーソナルコンピュータ、無線通信機能を有する携帯型情報端末（ＰＤＡや、ノート型パーソナルコンピュータなどを意味する）、あるいは携帯電話（ＰＨＳも含む）等のディジタル情報機器（デバイス）を意味する。また、ユーザ端末としては、前記のデバイス単体だけでなく、ＬＡＮもしくは無線ＬＡＮにより、複数のデバイスを接続して構成されるシステムを意味する場合もある。

【００１９】本システムでは、あるノード１０（Ａ）から送信されたストリームデータを受信したノード１０（Ｂ）は、ストリームデータを復号して再生（視聴）すると共に、他のノード１０に中継する。この場合、ノード１０（Ｂ）は、データ処理能力及びネットワーク接続帯域の許容範囲内で、複数のノード１０に対してストリームデータを中継する。

【００２０】要するに、本システムは、上流ノードから下流ノードへストリームデータの中継を実行することにより、高性能の配信用サーバを要することなく、多数のユーザ端末に対してストリームデータ配信を行なうストリームデータ分散配信機能を実現する。ここで、上流ノードとは、自ノードに対して上流であり、ストリームデータの送信元ノードまたは中継ノードである。また、下流ノードとは、自ノードに対してストリームデータの送信先ノードである。下流ノードは、ストリームデータを受信する受信ノード、または更に下流ノードに対して送信する中継ノードでもある。

【００２１】図２は、本システムの具体的構成の一例を示すブロック図である。

【００２２】本システムの具体的想定としては、多数のユーザ端末であるノード１０がインターネット２０に接続されて構築されたネットワークにおいて、ストリームデータ分散配信系に参加した各ユーザ端末に対してストリームデータが配信される構成である。各ノード１０は、例えばＡＤＳＬ伝送方式やＣＡＴＶネットワークを使用して、常時接続型の高速回線によりインターネットに接続される環境を想定している。

【００２３】あるノード１０は、例えばパーソナルコンピュータ（ＰＣ）１１と、ブロードバンド・ネットワーク接続インターフェース（ＢＢＮＩＤ）１２とを有するユーザ端末である。ＢＢＮＩＤ（Broad-Band Network Interface Device）１２は、具体的にはＡＤＳＬモデムまたはケーブルモデム（ＣＡＴＶインターネット用モデム）等と、ルータ機能とを一体化したネットワーク機器である。これらのノード１０は、インターネット２０を介して受信したストリームデータを、例えばＰＣ１１のディスプレイ上に再生し、かつ他の下流ノード１０へ中継する。

【００２４】また、あるノード１０は、例えばＰＣ１１とディジタルビデオカメラ（ＤＶＣ）１３とを有する。これらのノード１０は上流ノードとして、ＤＶＣ１３により撮影した映像（音声を含む）からなるストリームデータを、ＰＣ１１にセットされたソフトウェア（同実施形態のメイン構成要素）により送信するユーザ端末である。

【００２５】（ノードの構成）次に、図３を参照して、同実施形態のユーザ端末であるノード１０の構成を説明

する。

【００２６】同実施形態のノード１０は、例えばパーソナルコンピュータと、当該コンピュータにセットされるソフトウェアと、各種デバイスとから構成される。図３は、同実施形態のメイン構成要素であり、ＰＣ１１内で稼動する当該ソフトウェア構成を示すブロック図である。

【００２７】ストリームデータ分散配信システムを構成する各ノード１０は、全て同一のソフトウェア構成を有し、ストリームデータの送信、受信、中継、再生の各機能を実現する。以下、ソフトウェア構成の各要素について具体的に説明する。なお、同実施形態のソフトウェア構成は、特定のＯＳ（operating system）には依存しない設計である。

【００２８】本ソフトウェア構成は、トポロジエンジン３０と、ストリームエンジン３１と、ストリームスイッチ部３２と、ノード全体の操作環境を司るＧＵＩ（graphical user interface）３３と、ストリーム再生部３４とからなる。

【００２９】トポロジエンジン３０は、概略的にはメッセージ（制御情報）を交換することにより、各ノード１０間のネットワーク接続関係（トポロジ：topology）を構成する機能を実現する。具体的には、トポロジエンジン３０は、各ノード１０間をＴＣＰ／ＩＰ（transmission control protocol/internet protocol）で接続して、各種のメッセージを送受信する。さらに、トポロジエンジン３０は、直接あるいは間接的に接続された近傍のノードの存在を、メッセージの交換を通じて認識する。トポロジエンジン３０は、当該近傍ノードの存在情報及びストリームデータの受信状態から代替トポロジを求めて、当該トポロジに従って一度構成した各ノード１０間の接続関係を変更する。

【００３０】ストリームエンジン３１は、ノード１０間でのストリームデータの送信、受信、中継の各機能を実現するソフトウェアである。ストリームエンジン３１は、トポロジエンジン３０から受け取ったトポロジ情報（後述するトポロジ情報テーブル）に基づいて、隣接ノードである下流ノード（単数又は複数）に向けてストリームデータを送信する。また、隣接ノードである上流ノード（単数又は複数）からストリームデータを受信する。

【００３１】ここで、隣接ノードとは、自ノードと直接的に接続している上流又は下流のノードを意味する。また、近傍ノードとは、自ノードと間接的に接続している上流又は下流のノードを意味する。トポロジ情報（トポロジ情報テーブル）は、各ノード間の論理的な接続関係を示す情報（上流／下流及び隣接／近傍を識別する情報）、及び当該接続関係が形成された隣接または近傍のノードを特定する情報（ネットワークアドレスなど）を含む（図１５を参照）。

【００３２】ストリームエンジン３１は、ストリームデータ送受信用のＴＣＰ／ＩＰ接続を確立し、各ノード間でストリームデータの送受信を実行する。ストリームエンジン３１は、ストリームデータのデータ形式（符号化方式）に依存しない汎用的配送機能を有し、例えばＭＰＥＧ規格等の各種のデータ形式に適用できる構成である。

【００３３】ストリームスイッチ部３２は、ストリームエンジン３１と他の機能、デバイス、ファイルとの連携機能を実現するためのソフトウェアである。ストリームスイッチ部３２は主機能として、ストリーム再生部３４を起動し、ストリームエンジン３１から取り出したストリームデータを渡す。ストリーム再生部３４は、ストリームデータから出力用の映像や音声を復号化して、再生するためのソフトウェアである。更に、ストリームスイッチ部３２は、ローカル装置である例えばデジタルビデオカメラ（ＤＶＣ）１３や、ローカルファイル装置３６からストリームデータを取り出し、ストリームエンジン３１に渡すことにより他のノードに送信する機能を実現する。

【００３４】ＧＵＩ３３は、トポロジエンジン３０、ストリームエンジン３１、ストリームデータスイッチ部３２のそれぞれと、ユーザとのインターフェースを提供する。具体的には、ＧＵＩ３３は、ディスプレイの画面上に、隣接または近傍ノード間のトポロジ（接続関係）を可視的に表示したり、ストリームエンジン３１の通信データ量を可視的に表示する。また、ＧＵＩ３３は、ユーザからのコマンド入力に応じて、他ノードへの明示的接続要求や、自ノードの接続鍵の設定を行なう。接続鍵とは、トポロジエンジン３０に含まれるノード間の接続に関する認証機能で使用される鍵データである。

【００３５】ここで、接続鍵（ＣＫ）と公開鍵（ＰＫ）とを使用する認証機能を、具体的に説明する。あるノードが配信元（配信サーバの役割）となる場合、後述するように、ＧＵＩ３３の公開鍵取得部３３６が接続鍵発行サーバ７１から公開鍵（ＰＫ）を取得し、これをトポロジエンジン３０の接続認証部３０７が受け取り記憶する（図４及び図７を参照）。接続認証部３０７は、接続要求受理部３０６からの認証要求（接続鍵ＣＫを含む）に応じて、当該公開鍵（ＰＫ）を使用して接続鍵（ＣＫ）を復号して認証する。

【００３６】これに対して、視聴参加するノードは、ＧＵＩ３３の接続鍵取得部３３４が接続鍵発行サーバ７１から接続鍵（ＣＫ）を取得し、これをトポロジエンジン３０の接続認証部３０７が受け取り記憶する。また、上流ノードへの接続要求の際には、トポロジエンジン３０の接続要求部３０５は、接続認証部３０７から接続鍵（ＣＫ）を受け取り、上流ノードへ接続要求を実行する。

【００３７】更に、図４から図７を参照して、ノード１

０の各ソフトウェア構成を具体的に説明する。

【００３８】（トポロジエンジン）トポロジエンジン３０は、図４に示すように、トポロジ管理部３００、トポロジテーブル３０１、負荷状態監視部３０２、制御データ通信部３０３，３０４、接続要求部３０５、接続要求受理部３０６、及び接続認証部３０７の各機能要素部を有する。

【００３９】トポロジ管理部３００は、直接接続している上流ノードから受信したトポロジ情報（ＴＩ）に基づいて、隣接ノード群又は近傍ノード群の存在と、それらノード間の接続関係（トポロジ）を認識する。また、トポロジ管理部３００は、当該トポロジ情報（ＴＩ）のテーブル形式にしたトポロジ情報テーブルをトポロジテーブル３０１に記憶する（以下ＴＩを情報テーブルと表記する場合がある）。トポロジ管理部３００は、ノード間のトポロジの変化に応じて、トポロジテーブル３０１に記憶した情報テーブル（ＴＩ）を更新する。

【００４０】トポロジ管理部３００は、直接接続している隣接ノード、即ち上流ノード（通常では単数）及び下流ノード（単数又は複数）のノード識別子（ネットワークアドレス）をストリームエンジン３１に渡す。ストリームエンジン３１は、当該隣接ノードとの間にストリームデータ送受信用のＴＣＰ／ＩＰ接続を確立する。また、トポロジ管理部３００は、トポロジテーブル３０１に記憶された情報テーブル（ＴＩ）をＧＵＩ３３に渡す。ＧＵＩ３３は、当該情報テーブル（ＴＩ）に基づいて、ノード間のトポロジを可視化して画面上に表示する（図７を参照）。

【００４１】ここで、トポロジ情報テーブル（ＴＩ）について、図１４及び図１５を参照して具体的に説明する。

【００４２】図１４は、各ノード１０がネットワーク上で接続されている接続関係（トポロジ）の一例を示す図である。各ノード１０は、例えばネットワークアドレスに相当する識別子（ｎｏｄｅ０～ｎｏｄｅ５）により特定される。各ノード１０は、基本的には、自ノードに対して上流ノードからトポロジ情報（ＴＩ）を受け取り、トポロジテーブル３０１として登録する。そして、各ノード１０は、下流ノードからの接続要求に応じて、当該下流ノードとの接続関係を追加したトポロジ情報（ＴＩ）を下流ノードに提供する。

【００４３】ここで、仮に、ｎｏｄｅ０の上流ノード１０は、下流ノード（ｎｏｄｅ１，４）との接続関係を記録したトポロジ情報（ＴＩ－０）を、当該下流ノード（ｎｏｄｅ１，４）に提供する。このトポロジ情報（ＴＩ－０）は、図１５（Ａ）に示すように、接続関係にあるノード識別子（ｎｏｄｅ０，１，４）と、隣接ノード（直接的に接続したノード）である上流ノードの識別子（ｎｏｄｅ０のみ）とが対応付けされた情報テーブルである。なお、下流ノードの各識別子（ｎｏｄｅ１，４）に対しては、下流ノードであることを示すフラグ情報を付加してもよい。即ち、自ノード（ｎｏｄｅ０）は、当該フラグ情報により、トポロジ情報（ＴＩ－０）に登録された識別子（ｎｏｄｅ１，４）を隣接ノードである下流ノードとして認識できる。

【００４４】下流ノード（ｎｏｄｅ１）は、図１４に示すように、自ノードが上流ノードとして下流ノード（ｎｏｄｅ２，３）との接続関係を確立していると想定する。この場合、下流ノード（ｎｏｄｅ１）は、上流ノード（ｎｏｄｅ０）から提供されたトポロジ情報（ＴＩ－０）に、当該接続関係を追加したトポロジ情報（ＴＩ－１）を生成して、下流ノード（ｎｏｄｅ２，３）に提供する（図１５（Ｂ）を参照）。このトポロジ情報（ＴＩ－１）においても、同様に、下流ノードの各識別子（ｎｏｄｅ２，３）に対しては、下流ノードであることを示すフラグ情報を付加してもよい。

【００４５】ここで、下流ノード（ｎｏｄｅ２）は、提供されたトポロジ情報（ＴＩ－１）から、接続関係（１）～（３）を認識することができる。即ち、接続関係（１）として、自ノード以外に、上流ノード（ｎｏｄｅ１）に対する隣接ノードとして、下流ノード（ｎｏｄｅ３）の存在を認識できる。接続関係（２）として、自ノードの上流ノード（ｎｏｄｅ１）に対して、更に上流となるノード（ｎｏｄｅ０）の存在を認識できる。接続関係（３）として、上流ノード（ｎｏｄｅ０）の下流ノード（ｎｏｄｅ４）の存在を認識できる。これら間接的に接続されたノードｎｏｄｅ０、ｎｏｄｅ３，ｎｏｄｅ４は、自ノード（ｎｏｄｅ２）にとっての近傍ノードである。

【００４６】同様に、下流ノード（ｎｏｄｅ３）は、提供されたトポロジ情報（ＴＩ－１）から、接続関係（１）～（３）を認識することができる。即ち、接続関係（１）として、自ノード以外に、上流ノード（ｎｏｄｅ１）に対する隣接ノードとして、下流ノード（ｎｏｄｅ２）の存在を認識できる。接続関係（２）として、自ノードの上流ノード（ｎｏｄｅ１）に対して、更に上流となるノード（ｎｏｄｅ０）の存在を認識できる。接続関係（３）として、上流ノード（ｎｏｄｅ０）の下流ノード（ｎｏｄｅ４）の存在を認識できる。

【００４７】一方、下流ノード（ｎｏｄｅ４）は、図１４に示すように、自ノードが上流ノードとして下流ノード（ｎｏｄｅ５）との接続関係を確立していると想定する。この場合、下流ノード（ｎｏｄｅ４）は、提供されたトポロジ情報（ＴＩ－０）に、当該接続関係を追加したトポロジ情報（ＴＩ－４）を生成して、下流ノード（ｎｏｄｅ５）に提供する（図１５（Ｃ）を参照）。このトポロジ情報（ＴＩ－４）においても、同様に、下流ノードの識別子（ｎｏｄｅ５）に対しては、下流ノードであることを示すフラグ情報を付加してもよい。

【００４８】以上要するに、各ノードは、基本的に上流

から下流へ提供されるトポロジ情報（ＴＩ）をトポロジテーブル３０１として管理（登録、更新、提供等）することにより、隣接ノード及び近傍ノードの存在を認識することができる。隣接ノードとは、前述したように、自ノードと直接的に接続する上流ノード又は下流ノードである。近傍ノードとは、自ノードと間接的に接続されたノードである（必ずしも自ノードより上流又は下流の関係とは限らない）。

【００４９】なお、トポロジ情報（ＴＩ）は、下流に行くほど情報量が増大することになる。このため、予め情報量の上限値を設定し、当該上限値を超えた場合には、トポロジ管理部３００は、自ノードから最も遠い関係にあるノードの情報（識別子等）を削除するような構成が望ましい。

【００５０】負荷状態監視部３０２は、図４に示すように、後述するストリームエンジン３１のストリームデータバッファ（ＦＩＦＯ式バッファ）の格納状態（ＳＢ）を監視し、これによりストリームエンジン３１の負荷状態を判断する。負荷状態監視部３０２は、ストリームエンジン３１の負荷状態が許容範囲を超える場合には、トポロジ管理部３００に対して下流ノードの切断を指示する。なお、後述するように、ストリームエンジン３１のストリームデータバッファの格納状態（ＳＢ）は、ＧＵＩ３３に対しても通知される。

【００５１】制御データ通信部３０３は、接続要求部３０５からの指示に応じて、上流ノード１０Ａとの制御データ通信チャネルを確立する。上流ノード１０Ａは、自ノード１０からはストリームデータの送信元ノードに相当する。制御データ通信部３０３は、トポロジ情報（ＴＩ）を上流ノード１０Ａから受信する。また、制御データ通信部３０３は、上流ノード１０Ａを別のノードに切替える場合に、制御データ通信チャネルの切断を行なう。

【００５２】制御データ通信部３０４は、接続要求受理部３０６からの指示に応じて、下流ノード１０Ｂとの制御データ通信チャネルを確立する。下流ノード１０Ｂは、自ノードから送信するストリームデータの送信先ノードに相当する。制御データ通信部３０４は、トポロジ情報（ＴＩ）を下流ノード１０Ｂへ送信する。また、制御データ通信部３０４は、下流ノード１０Ｂが上流ノードを自ノードから別ノードへ切替えるときに、制御データ通信チャネルの切断を行なう。

【００５３】接続要求部３０５は、ＧＵＩ３３からの上流ノードの指定（ＣＲ）に応じて、上流ノード１０Ａに対する接続要求を行なう。さらに、接続要求部３０５は、接続要求を送信した上流ノード１０Ａからの接続受理通知に応じて、制御データ通信部３０３に対して接続を指示する。このとき、トポロジ管理部３００に対して、制御データ通信チャネルが確立された上流ノード１０Ａのネットワークアドレスの登録を指示する。接続要求部３０５は、接続要求に伴なって、接続対象の上流ノード１０Ａとの間で接続認証処理に必要な接続鍵データ（ＣＫ）と公開鍵データ（ＰＫ）の交換を行なう。

【００５４】接続要求受理部３０６は、下流ノード１０Ｂからの接続要求に応じて、接続認証部３０７により認証された場合に接続受理を行なう。接続要求受理部３０６は、接続受理に応じて制御データ通信部３０４に対して接続を指示すると共に、トポロジ管理部３００に対して、制御データ通信チャネルが確立された下流ノード１０Ｂのネットワークアドレスの登録を指示する。接続要求受理部３０６は、接続受理に伴なって、接続対象の下流ノード１０Ｂとの間で接続認証処理に必要な接続鍵データ（ＣＫ）と公開鍵データ（ＰＫ）の交換を行なう。なお、接続認証処理手順については、後述する。

【００５５】接続認証部３０７は、接続要求部３０５及び接続受理部３０６による他のノード（上流ノードと下流ノード）との接続に必要な接続認証処理を実行する。接続認証部３０７は、公開鍵暗号方式を利用した認証処理を実行し、認証チケットに相当する接続鍵データ（ＣＫ）と公開鍵データ（ＰＫ）をＧＵＩ３３から受け取る。また、接続認証部３０７は、接続要求部３０５及び接続要求受理部３０６のそれぞれとの間で、接続鍵データ（ＣＫ）と公開鍵データ（ＰＫ）の交換を実行する。

【００５６】ここで、前述したように、あるノードが配信元（配信サーバの役割）となる場合、ＧＵＩ３３の公開鍵取得部３３６が接続鍵発行サーバ７１から公開鍵データ（ＰＫ）を取得し、これをトポロジエンジン３０の接続認証部３０７が受け取り記憶する。接続認証部３０７は、接続要求受理部３０６からの認証要求（接続鍵データＣＫを含む）に応じて、当該公開鍵データ（ＰＫ）を使用して接続鍵データ（ＣＫ）を復号して認証する。また、視聴参加するノードは、ＧＵＩ３３の接続鍵取得部３３４が接続鍵発行サーバ７１から接続鍵データ（ＣＫ）を取得し、これをトポロジエンジン３０の接続認証部３０７が受け取り記憶する。また、上流ノードへの接続要求の際には、トポロジエンジン３０の接続要求部３０５は、接続認証部３０７から接続鍵データ（ＣＫ）を受け取り、上流ノードへ接続要求を実行する。

【００５７】（ストリームエンジン）ストリームエンジン３１は、図５に示すように、ストリームデータ送信部３１１、ストリームデータ受信部３１２、ストリームデータバッファ３１３、ストリームデータバッファ状態監視部３１４、及びストリームデータ通信接続管理部３１５の各機能要素部を有する。

【００５８】ストリームデータ送信部３１１は、ストリームデータバッファ３１３に格納されたストリームデータを下流ノードに送信する（中継する）。このとき、ストリームデータ送信部３１１は、ストリームデータ通信接続管理部３１５から接続許可の指示がなされた下流ノードに対してストリームデータを送信する。

【００５９】ストリームデータバッファ３１３は、ストリームデータ受信部３１２で受信された上流ノードからのストリームデータ、または、ストリームスイッチ部３２から受け取ったストリームデータを一時的に保存するＦＩＦＯ式バッファである。ストリームデータバッファ状態監視部３１４は、ストリームデータバッファ３１３の格納状態（ＳＢ）を常に監視し、トポロジエンジン３０及びＧＵＩ３３に通知する。ここで、格納状態（ＳＢ）とは、バッファ３１３のサイズに対してストリームデータが格納されているデータ量を意味する。

【００６０】ストリームデータ受信部３１２は、ストリームデータ通信接続管理部３１５から指定された上流ノードとの間にストリームデータ通信チャネルを確立する。そして、当該上流ノードから送信されたストリームデータを受信して、ストリームデータバッファ３１３に書き込む。ストリームデータ通信接続管理部３１５は、ストリームデータ通信チャネルによる接続関係を確立すべき隣接ノードのリストをトポロジエンジン３０から受け付ける。

【００６１】（ストリームスイッチ部）ストリームデータスイッチ部３２は、図６に示すように、ＧＵＩ３３からの指定（ＳＷ）に応じて、ストリームデータの入出力を切替える。即ち、ストリームスイッチ部３２は、ストリームエンジン３１から受け取ったストリームデータを、ストリームデータ再生部３４またはノードのローカルファイル装置６０に転送する。また、ストリームスイッチ部３２は、ローカル装置であるデジタルビデオカメラ（ＤＶＣ）３５や、エンコーダデバイス３６からのストリームデータ又はローカルファイル装置６０に格納しているストリームデータを読出して、ストリームエンジン３１に転送する。

【００６２】（ＧＵＩ）ＧＵＩ３３は、図７に示すように、ストリームデータ中継制御部３３１、中継状態（品質）表示部３３２、トポロジ表示部３３３、接続鍵取得部３３４、上流ノード決定部３３５、及び公開鍵取得部３３６の各機能要素部を有する。ＧＵＩ３３は、表示装置７０の表示画面上のアイコンに対する操作に応じたコマンドを入力したり、当該表示画面上に各種の表示情報を表示する。

【００６３】ストリームデータ中継制御部３３１は、ユーザからのコマンド入力に応じて、ストリームデータ中継の停止又は再開の指示（ＳＣ）をストリームエンジン３１に対して行なう。中継状態（品質）表示部３３２は、ストリームエンジン３１からストリームデータバッファ３１３の格納状態（ＳＢ）を読取り、表示画面上に表示させる処理を実行する。

【００６４】トポロジ表示部３３３は、トポロジエンジン３０からのトポロジ情報（ＴＩ）を受け取り、隣接ノード又は近傍ノードの接続関係を表示画面上に表示させる処理を実行する。接続鍵取得部３３４は、ユーザから入力された接続鍵データ（ＣＫ）、または後述する接続鍵発行サーバ７１から発行された接続鍵データ（ＣＫ）をトポロジエンジン３０に渡す。上流ノードへの接続要求の際には、トポロジエンジン３０の接続要求部３０５は、接続認証部３０７から接続鍵データ（ＣＫ）を受け取り、上流ノードへ接続要求を実行する。

【００６５】ＧＵＩ３３の公開鍵取得部３３６は、あるノードが配信元（配信サーバの役割）となる場合、接続鍵発行サーバ７１から公開鍵データ（ＰＫ）を取得し、トポロジエンジン３０の接続認証部３０７に渡す。接続認証部３０７は、接続要求受理部３０６からの認証要求（接続鍵データＣＫを含む）に応じて、当該公開鍵データ（ＰＫ）を使用して接続鍵データ（ＣＫ）を復号して認証する。

【００６６】上流ノード決定部３３５は、ユーザから指定された上流ノード、または後述するノード仲介サーバ７２から仲介された上流ノードのネットワークアドレスをトポロジエンジン３０に渡す。

【００６７】（接続確立手順）以下図８を参照して、同実施形態のノード間の接続処理の手順を説明する。

【００６８】ノード間の接続処理は、図８（Ａ）に示す自ノードから見て下流ノードとの接続処理と、同図（Ｂ）に示す自ノードから見て上流ノードとの接続処理とに分けられる。要するに、自ノードは、相対的関係としての上流ノードまたは下流ノードとの接続処理を実行する。

【００６９】まず、上流ノードとの接続処理では、自ノードのトポロジエンジン３０は、上流ノードに対して接続要求メッセージを送信する（ステップＳ１）。具体的には、図４に示す接続要求部３０５が、接続鍵データとＩＤデータとを含む接続要求メッセージを送信する。ＩＤデータは、例えばストリームデータ配信を行なう特定のネットワークを構築する目的のグループＩＤ、またはストリームデータのコンテンツ毎に設定されたコンテンツＩＤ等を含む。また、ＩＤデータは、各ノードのハードウェアを識別するためのＩＤデータ（例えばネットワーク・インターフェースのＭＡＣアドレスや、マイクロプロセッサに埋め込まれたシリアル番号など）を含む。

【００７０】自ノードは、上流ノードから接続要求に対する回答（接続認証処理の結果）を受信するまで待機状態となる（ステップＳ２）。そして、上流ノードから接続許可のメッセージを受信すると、トポロジエンジン３０は、当該上流ノードとの制御通信チャネルを確立し、当該上流ノードをトポロジテーブル３０１に登録する（ステップＳ４）。また、トポロジエンジン３０は、上流ノードから受信した接続許可のメッセージに含まれる公開鍵データを記憶する。更に、トポロジエンジン３０は、接続した上流ノードをストリームエンジン３１に登録させる（ステップＳ５）。これにより、ストリームエンジン３１は、当該上流ノードとストリームデータ通信

チャネルを接続し、ストリームデータを受信可能な状態となる。

【００７１】一方、自ノードは、上流ノードから接続拒否のメッセージを受信すると、別の上流ノードとの接続を試みる処理に移行できる（ステップＳ３のＮＯ，Ｓ６）。ここで、別の上流ノードとは、自ノードが要望するストリームデータの配信を受けるために必要な上流ノードであり、ストリームデータ分散配信ネットワークを構成する同一グループに所属するノードである（後述する）。

【００７２】次に、下流ノードとの接続処理、即ち、自ノードが相対的に上流ノードの場合の接続処理を、図８（Ａ）に示すフローチャートを参照して説明する。

【００７３】自ノードは、下流ノードから接続鍵データを含む接続要求メッセージを受信すると、接続認証処理を実行する（ステップＳ１１，Ｓ１２）。トポロジエンジン３０の接続認証部３０７は、接続鍵を予め取得してある公開鍵データを用いて復号することにより接続認証処理を実行し、認証できない場合には接続拒否メッセージを下流ノードに返信する（ステップＳ１３のＮＯ，Ｓ１７）。

【００７４】一方、トポロジエンジン３０は、認証成功の場合には、既存の下流ノードへのストリームデータ中継の品質が規定値以上であるか否かを判定し、判定結果が規定値以下の場合には接続拒否メッセージを下流ノードに返信する（ステップＳ１１４のＮＯ，Ｓ１７）。即ち、新たな下流ノードを接続した結果、中継品質が規定値以下になる場合には、自ノードは、下流ノードを増やすことを防ぐため接続を拒否する。

【００７５】トポロジエンジン３０は、最終的に接続を許可する場合には、公開鍵データを含む接続許可メッセージを下流ノードに返信する（ステップＳ１４のＹＥＳ，Ｓ１５）。更に、トポロジエンジン３０は、接続を許可した下流ノードをトポロジテーブル３０１に登録すると共に、当該下流ノードをストリームエンジン３１に登録させる（ステップＳ１６）。これにより、ストリームエンジン３１は、当該下流ノードとストリームデータ通信チャネルを接続し、ストリームデータを送信可能な状態となる。

【００７６】以上のような接続処理により、上流ノード及び下流ノードの各ノード間の接続が確立されて、図１に示すように、ストリームデータ分散配信系のネットワークを構成することができる。

【００７７】（上流ノード取得手順）以下図９を参照して、自ノードがストリームデータ配信を受けるために、即ちストリームデータ分散配信系に参加するために、新規に上流ノードを取得するための手順を説明する。ここで、同図（Ａ），（Ｃ）に示すステップＳ２１からステップＳ２６は、各ノード側での処理手順を示す。また、同図（Ｂ）に示すステップＳ３１からステップＳ３７は、ノード仲介サーバ側での処理手順を示す。

【００７８】ここでは、ノード仲介サーバ（図７のサーバ７２）の存在を想定し、このノード仲介サーバから上流ノードの紹介を受ける構成を説明する。

【００７９】ノード仲介サーバは、グループＩＤに対応する、即ち一つのストリームデータ分散配信系に属する複数のノードをノードデータベース７２０に登録している。当然ながら、ノードデータベース７２０には、複数のグループＩＤ（ストリームデータ分散配信系）についてそれぞれに属すノードを登録することができる。

【００８０】まず、自ノードは、上流ノード紹介要求メッセージ（グループＩＤを含む）を、ノード仲介サーバに送信する（ステップＳ２１）。ノード仲介サーバは、当該メッセージを受信すると、ノードデータベース７２０から当該ストリームデータ分散配信系に属すノードを検索する（ステップＳ３１，Ｓ３２）。そして、ノード仲介サーバは、検索したノードのネットワークアドレスを含む応答メッセージを返信する（ステップＳ３３）。

【００８１】自ノードは、応答メッセージから紹介された上流ノードのネットワークアドレスを取得し、当該上流ノードとの接続処理に移行する（ステップＳ２２，Ｓ２３）。ステップＳ２３は、図８のステップＳ１から開始される処理ステップである。この接続処理では、前述したように、紹介された上流ノードは、接続認証処理を実行して、最終的に接続許可又は接続拒否の判定を実行する。自ノードは、上流ノードとの接続が完了しない場合には、再度、ノード仲介サーバに対して紹介要求メッセージを送信する（ステップＳ２４のＮＯ，Ｓ２１）。

【００８２】上流ノードとの接続が完了すると、ノード仲介サーバに接続完了メッセージを送信する（ステップＳ２４のＹＥＳ，Ｓ２５）。ノード仲介サーバは、当該メッセージを受信すると、ノードデータベース７２０に当該自ノードを登録する（ステップＳ３４，Ｓ３５）。一方で、ノード仲介サーバは、自ノードからストリームデータ分散配信系ネットワークからの離脱を示すノード離脱メッセージを受信すると、ノードデータベース７２０から当該自ノードの登録を削除する（ステップＳＳ２６，Ｓ３６，Ｓ３７）。

【００８３】以上のような処理により、ストリームデータ分散配信系のネットワークに参加を希望するユーザは、ストリームデータを中継してくれる上流ノードに接続することができる。なお、ノード仲介サーバを介在させることなく、別の方法で上流ノードのネットワークアドレスを取得できれば、当該上流ノードへの接続は可能である。

【００８４】（トポロジ変更手順）以下図１０を参照して、各ノード間を接続して構成されたストリームデータ分散配信系ネットワークの接続関係であるトポロジを変更する場合の手順を説明する。

【００８５】ここでは、図１０（Ａ）に示すように、相

対的に下流側のノード（１）、ノード（２）、及び上流側のノード（３）が接続された状態のトポロジを想定する。ノード（２）は、同図（Ｂ）に示すように、トポロジ変更処理として、ノード（１）に対する上流ノードの変更処理を実行する。即ち、ノード（２）は、代替上流ノード（３）の指定を含む上流ノード変更メッセージを、下流ノード（１）に送信する（ステップＳ４１）。

【００８６】下流ノード（１）は、同図（Ｃ）に示すように、上流ノード（２）から上流ノード変更メッセージを受信すると、指定された代替上流ノード（３）に対する接続処理を実行する（ステップＳ４５，Ｓ４６）。接続処理では、下流ノード（１）は、代替上流ノード（３）に対して接続要求メッセージを送信する。代替上流ノード（３）は、同図（Ｄ）に示すように、受信した接続要求メッセージに基づいて、下流ノード（１）との接続処理を実行する（ステップＳ５０）。そして、代替上流ノード（３）は、接続許可メッセージまたは接続拒否メッセージを下流ノード（１）に返信する。なお、ステップＳ４６，Ｓ５０は、図８のステップＳ１，Ｓ１１から開始される処理ステップに対応する。

【００８７】下流ノード（１）は、代替上流ノード（３）から接続許可メッセージを受信した場合に、上流変更完了の通知を上流ノード（２）に送信する（ステップＳ４７）。下流ノード（１）は、上流ノード（２）との通信チャネル（制御データ通信チャネルとストリームデータ通信チャネル）を切断し、トポロジテーブル３０１から上流ノード（２）の登録を削除する（ステップＳ４８，Ｓ４９）。

【００８８】一方、上流ノード（２）は、上流変更完了の通知を受信すると、下流ノード（１）との通信チャネル（制御データ通信チャネルとストリームデータ通信チャネル）を切断し、トポロジテーブル３０１から下流ノード（２）の登録を削除する（ステップＳ４２，Ｓ４３，Ｓ４４）。

【００８９】以上のような上流変更処理により、上流ノードと下流ノードとの接続関係が変更されて、結果として各ノード間の接続関係であるトポロジを変更できる。このトポロジ変更機能は、例えばノード（２）がネットワークから離脱したり、新たにノード（３）が参加するような場合に有効である。即ち、下流ノード（１）は、各ノードの状況に応じて動的かつ自律的に上流ノードを変更できるため、ストリームデータを停止することなく受信することができる。

【００９０】（接続切断手順）以下図１１を参照して、同実施形態のノード間の接続切断処理の手順を説明する。ここでは、下流ノードから上流ノードに対する接続を切断する場合の手順を説明する。逆の場合も、基本的には同様の手順となる。

【００９１】まず、下流ノードは、同図（Ａ）に示すように、接続されている上流ノードに対して切断メッセージを送信する（ステップＳ６１）。上流ノードは、同図（Ｂ）に示すように、切断メッセージを受信すると、下流ノードに対して切断受理の通知を送信する（ステップＳ６６，Ｓ６７）。

【００９２】下流ノードは、上流ノードから切断受理の通知を受信すると、当該上流ノードとの通信チャネル（制御データ通信チャネルとストリームデータ通信チャネル）を切断する（ステップＳ６２，Ｓ６３）。さらに、下流ノードは、トポロジテーブル３０１から当該上流ノードの登録を削除する（ステップＳ６４）。

【００９３】一方、上流ノードは、下流ノードとの通信チャネル（制御データ通信チャネルとストリームデータ通信チャネル）を切断する（ステップＳ６８）。さらに、上流ノードは、トポロジテーブル３０１から下流ノードの登録を削除する（ステップＳ６９）。

【００９４】以上のような接続切断処理により、各ノードは、任意のタイミングで接続関係にあるノードとの接続を切断できる。この接続切断処理により、各ノード間のトポロジが変更となる。

【００９５】（下流ノードの処理手順）図１２は、下流ノード側の処理手順を整理して説明するためのフローチャートである。

【００９６】まず、ユーザがストリームデータ分散配信系ネットワークに参加する場合には、ユーザ端末が下流ノードとして初期化処理を実行することになる（ステップＳ７０）。具体的には、前述したように、ノード仲介サーバから上流ノードの紹介を受ける（ステップＳ８０）。当該下流ノードは、紹介された上流ノードに対する接続要求を実行する（ステップＳ８１）。上流ノードから接続許可通知を受信した場合には、上流ノードとの接続が完了となる（ステップＳ８２のＹＥＳ）。これにより、下流ノードは、紹介された上流ノードからストリームデータを受信することができる。

【００９７】次に、接続されている上流ノードから上流変更メッセージを受信すると（ステップＳ７１）、下流ノードは、当該メッセージに含まれる代替上流ノードに対して、接続要求を行なう（ステップＳ８１）。この接続要求に対して、代替上流ノードから接続許可通知を受信した場合には、上流ノードとの接続が完了となる（ステップＳ８２のＹＥＳ）。ここで、下流ノードは、紹介された上流ノードまたは代替上流ノードから接続拒否通知を受信した場合あるいは何ら応答が得られない場合には、ノード仲介サーバから新たな上流ノードの紹介を受ける（ステップＳ８２のＮＯ（Ａ），Ｓ８０）。

【００９８】一方、下流ノードは、接続している上流ノードとの通信途絶（通信チャネルの切断も含む）を検出した場合には（ステップＳ７２）、トポロジテーブル３０１から別の上流ノードを選択する（ステップＳ８３）。下流ノードは、選択した上流ノードに対する接続要求を実行する（ステップＳ８１）。上流ノードから接

続許可通知を受信した場合には、上流ノードとの接続が完了となる（ステップＳ８２のＹＥＳ）。

【００９９】選択した上流ノードから接続拒否通知を受信した場合には、下流ノードは、トポロジテーブル３０１から全ての上流ノードの候補について、選択及び接続要求を実行する（ステップＳ８２のＮＯ（Ｂ），Ｓ８４のＮＯ）。全ての上流ノードの候補から接続拒否通知を受信した場合には、下流ノードは、改めて、ノード仲介サーバから新たな上流ノードの紹介を受ける（ステップＳ８４のＹＥＳ，Ｓ８０）。

【０１００】また、下流ノードは、接続している上流ノードからのストリームデータ中継の品質低下を検出した場合には（ステップＳ７３）、当該上流ノードとの接続を切断し、トポロジテーブル３０１から別の上流ノードを選択する処理に移行する（ステップＳ８５，Ｓ８３）。以後の処理については、前記の上流ノードとの通信途絶の場合と同様である。

【０１０１】（トポロジ情報の交換手順）図１３は、各ノード間でのトポロジ情報の交換手順を整理して説明するためのフローチャートである。

【０１０２】各ノードは、前述したように、トポロジエンジン３０において、トポロジ管理部３００、トポロジテーブル３０１、及び制御データ通信部３０３，３０４により、トポロジ情報テーブル（ＴＩ）を交換する。

【０１０３】ここでは、上流ノードから下流ノードに対して、トポロジ情報テーブル（ＴＩ）を送信する場合を想定する。上流ノードは、接続した下流ノードに対して、自ノードと隣接ノードまたは近傍ノードとの接続関係を示すトポロジ情報テーブルを送信する（ステップＳ９０）。下流ノードは、上流ノードからトポロジ情報テーブルを受信すると、トポロジテーブル３０１に併合（追加）処理して格納する（ステップＳ９１，Ｓ９２）。

【０１０４】以上のように同実施形態によれば、特にブロードバンドのインターネット等のネットワーク環境において、各ノードに設けられたトポロジエンジン３０の機能により、各ノード間を接続して、上流ノードと下流ノードとから構成されるストリームデータ分散配信系ネットワークを形成することができる。具体的には、図１に示すように、例えば最上流のノード１０（Ａ）から送信するストリームデータを、近傍の下流ノード１０（Ｂ）に配信する。当該下流ノード１０（Ｂ）は、受信したストリームデータを復号して再生すると同時に、上流ノードとして、更に下流ノードに対して当該ストリームデータを中継する。同様にして、各下流ノードは、受信したストリームデータを復号再生すると同時に、上流ノードとして、更に下流ノードに対して中継する。但し、一般的には、各ノードは、ＩＳＰ（インターネット接続サービスプロバイダ）や通信事業者などを介して、インターネットへの接続を行なうことになる。

【０１０５】従って、ストリームデータ配信用のサーバが存在しなくても、クライアント（ユーザ端末）のみから構成されるストリームデータ配信系のネットワークを実現できる。このような分散ネットワーク形成機能を利用することにより、ストリームデータ配信用のサーバからストリームデータ配信を行なうネットワークの場合でも、当該サーバの配信処理に要する負荷の軽減を図ることができる。即ち、例えば放送事業者が運営するサーバから、各ユーザ端末にストリームデータを配信すると共に、当該各ユーザ端末から他の各ユーザ端末に対して当該ストリームデータを配信することができる。これにより、放送事業者が運営するサーバの負荷を、ストリームデータ配信先のユーザ端末数に依存せずに低く抑えることができる。

【０１０６】また、いわゆる商業用ストリームデータ配信系のネットワークではなく、ユーザが個人的な撮影映像などを、インターネットに接続した関係者のみの各ノードに対して配信するためのプライベートネットワークを構築することができる。このようなプライベートネットワークを利用して、パーソナル放送とも言えるサービスが可能となる。

【０１０７】なお、同実施形態では、ノード仲介サーバの存在を想定した場合について言及している。このノード仲介サーバは、ストリームデータ配信用のサーバ、即ち分散配信系の中央制御サーバとは全く異なるものであり、単に上流サーバとしての候補を紹介するだけの限定された機能しか備えていないサーバである。従って、当該サーバは、ネットワークを構成する全ノードを正確に認識するようなデータベースを必要とせず、ネットワークに参加しているノードの中で未知のノードが存在していても差し支えない。また、ユーザが、ノード仲介サーバからの紹介とは別の方法で、上流ノードを知っている場合には、当然ながら、ノード仲介サーバは不要である。要するに、同実施形態では、ノード仲介サーバの存在は必須要件ではなく、実際上のサービス効率の観点からは望ましい存在である。

【０１０８】（同実施形態に適用可能なビジネスモデルまたは応用例）同実施形態のストリームデータ分散配信系ネットワークを適用することにより、以下のようなビジネスモデルまたは応用例を実現できる。

【０１０９】（１）例えば結婚式の披露宴などで、ユーザが個人的に撮影した映像を、ストリームデータとして各ユーザ（関係者のみ）に配信するパーソナル放送またはコミュニティ放送とも呼べるシステムを実現できる。この場合、ネットワークを構築する各ノードは、例えば公開鍵方式による接続認証機能により特定されるユーザ端末のみから構成される。

【０１１０】（２）前記（１）の拡張系として、ビデオカメラを用意した複数のユーザが集まり、各ユーザ間で同時に送受信することにより、ビデオ・チャット・サー

ビスを実現できる。

【０１１１】（３）ビデオカメラを備えたノードを、例えば街頭など屋外の特定の場所や、ビル、コンサートホール等に設置し、事件やイベントが発生した場合に、当該ビデオカメラにより撮影した映像（音声付）を、予め契約し、接続鍵の配布を受けた各ノードに対して中継するロケーション・サービスとも呼べるビジネスモデルを実現できる。この場合、各ノードは、サービス事業会社と契約することにより、当該会社が運営するネットワークに接続して、中継サービスを受けられる。具体的には、いわゆるインターネット・コンサートライブ放送を容易に実現できる。

【０１１２】（４）コンテンツの商用配信サービス系ネットワークにおいて、事業者が運営するサーバから各ユーザに対して、有料のコンテンツを配信する場合に、ユーザが中継ノードを提供することにより、サーバ側の配信負荷を軽減できる。この場合、中継ノードを提供したユーザに対して、当該コンテンツの視聴チケットに交換できるポイントを提供するようなインセンティブを与えることにより、同実施形態のシステムを有効に利用することができる。

【０１１３】（５）ノード間の制御データ通信チャネルを利用して、下流ノードから上流ノードへの情報通信を含め、各ノード間をピア・ツー・ピア（peer-to-peer）通信で結ぶことによって、ストリーム配信と同時に様々なコミュニケーション・サービスを実現することができる。例えば、下流から上流へと情報を集約することにより、配信コンテンツの人気投票サービス、クイズやアンケートに対するリアルタイム・サービスが可能となる。この場合も、同時アクセスを処理する大規模なサーバが不要になることがメリットである。また、下流ノード同士でチャットなどのコミュニケーションをストリーム配信と同時に実現できる。コンサート放送を見ながら、視聴者同士がチャットし合うようなサービスを提供できる。

【０１１４】

【発明の効果】以上詳述したように本発明によれば、インターネットなどのネットワーク環境において、特にユーザ端末間での自律的又は個人的なストリームデータ配信を実現できるストリームデータ分散配信技術を提供できる。具体的には、例えばブロードバンドのネットワーク環境を利用して、特別のストリームデータ配信用サーバを用意することなく、クライアント（端末ノード）間での動画・音声のストリームデータの分散配信を実現できる。

【図面の簡単な説明】

【図１】本発明の実施形態に関するストリームデータ分散配信システムの概念を示す図。

【図２】同実施形態に関するシステムの具体的構成の一例を示すブロック図。

【図３】同実施形態に関するノード（ユーザ端末）の構成を示すブロック図。

【図４】同ノードのトポロジエンジンの構成を示すブロック図。

【図５】同ノードのストリームエンジンの構成を示すブロック図。

【図６】同ノードのストリームデータスイッチ部の構成を示すブロック図。

【図７】同ノードのＧＵＩの構成を示すブロック図。

【図８】同実施形態に関するノード間の接続確立処理の手順を説明するためのフローチャート。

【図９】同実施形態に関する上流ノード取得手順を説明するためのフローチャート。

【図１０】同実施形態に関するトポロジ変更手順を説明するためのフローチャート。

【図１１】同実施形態に関するノード間の接続切断処理の手順を説明するためのフローチャート。

【図１２】同実施形態に関する下流ノード側の処理手順を説明するためのフローチャート。

【図１３】同実施形態に関する各ノード間でのトポロジ情報の交換手順を説明するためのフローチャート。

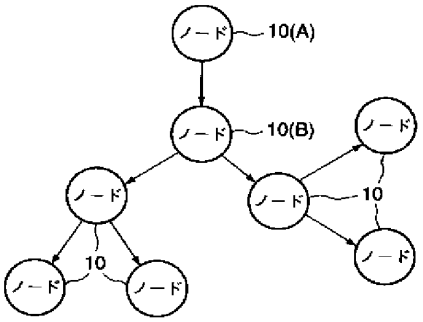
【図１４】同実施形態に関するトポロジ情報の内容を説明するための図。

【図１５】同トポロジ情報の一例を示す図。

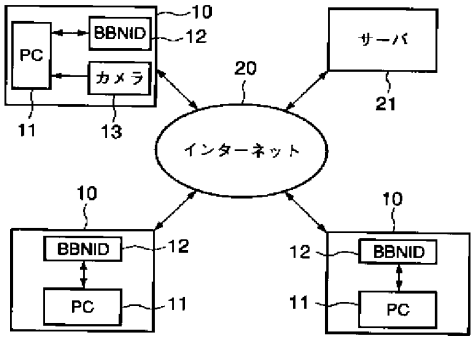
【符号の説明】

１０…ノード
１１…パーソナルコンピュータ（ＰＣ）
１２…ルータ
１３…ディジタルビデオカメラ（ＤＶＣ）
２０…インターネット
３０…トポロジエンジン
３１…ストリームエンジン
３２…ストリームスイッチ部
３３…ＧＵＩ
３４…ストリームデータ再生部
３００…トポロジ管理部
３０１…ノードテーブル
３０２…負荷状態監視部
３０３…制御データ通信部
３０４…制御データ通信部
３０５…接続要求部
３０６…接続要求受理部
３０７…接続認証部
３１１…ストリームデータ送信部
３１２…ストリームデータ受信部
３１３…ストリームデータバッファ
３１４…ストリームデータバッファ状態監視部
３１５…ストリームデータ通信接続管理部

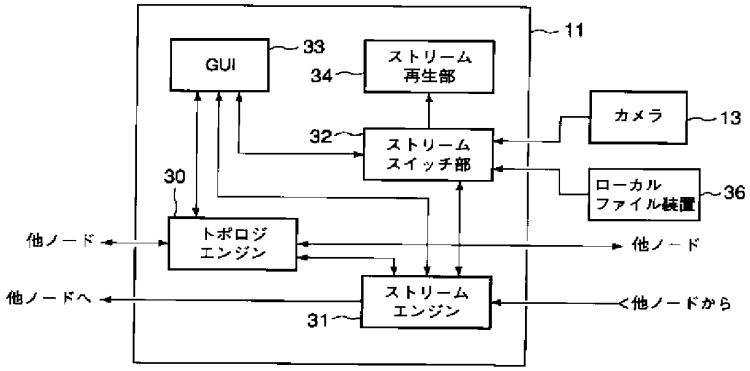
【図１】


ノード
10(A)
ノード
10(B)
ノード
ノード
ノード
10
10
ノード
ノード

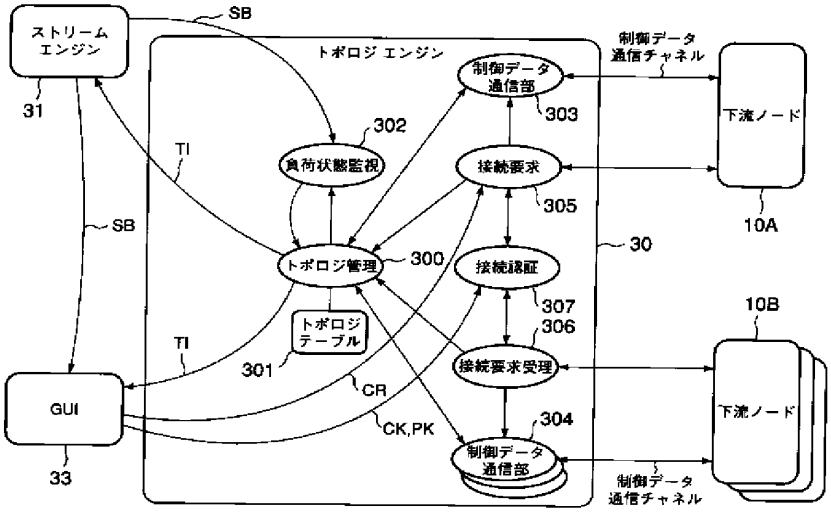
【図２】


10
PC
BBNID
12
カメラ
11
13
20
サーバ
21
インターネット
10
10
BBNID
12
PC
11
12
BBNID
11
PC

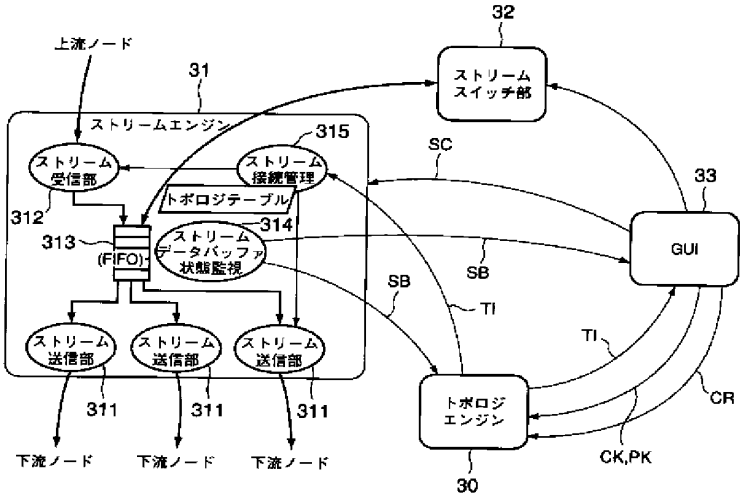
【図３】


11
GUI
33
34
ストリーム
再生部
カメラ
13
32
ストリーム
スイッチ部
30
ローカル
ファイル装置
36
他ノード
トポロジ
エンジン
他ノード
他ノードへ
ストリーム
エンジン
31
他ノードから

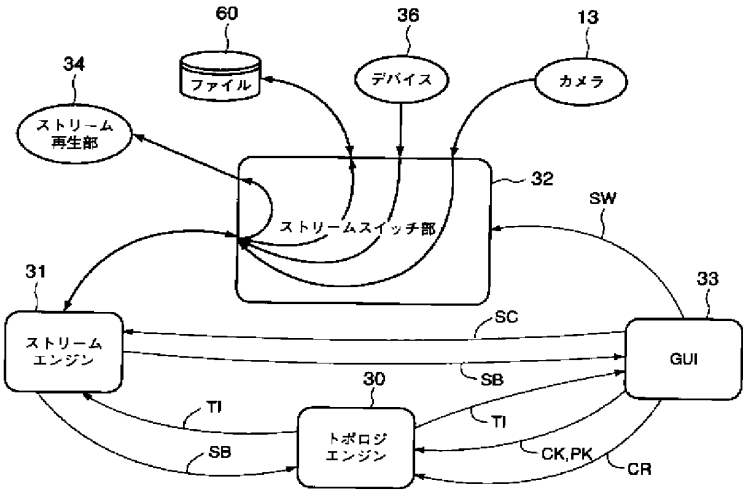
【図４】


ストリーム
エンジン
SB
31
トポロジ エンジン
制御データ
通信チャネル
制御データ
通信部
303
下流ノード
302
負荷状態監視
TI
接続要求
305
10A
SB
30
トポロジ管理
300
接続認証
307
306
10B
トポロジ
テーブル
301
TI
接続要求受理
CR
CK,PK
304
下流ノード
GUI
33
制御データ
通信部
制御データ
通信チャネル

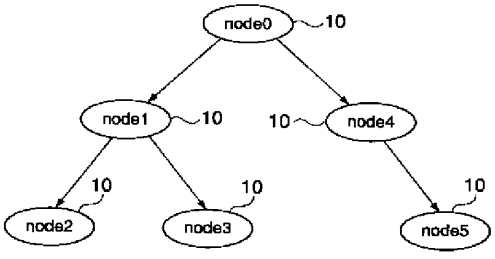
【図５】


上流ノード
31
32
ストリームスイッチ部
ストリームエンジン
315
ストリーム受信部
ストリーム接続管理
SC
33
トポロジテーブル
312
313
314
(FIFO)
ストリームデータバッファ状態監視
GUI
SB
SB
TI
TI
ストリーム送信部
ストリーム送信部
ストリーム送信部
トポロジエンジン
CR
311
311
311
CK,PK
下流ノード
下流ノード
下流ノード
30

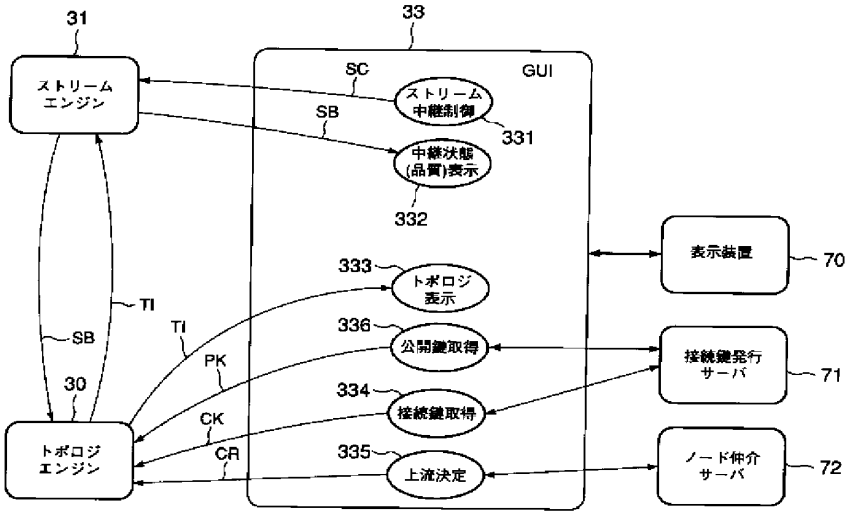
【図６】


60
36
13
34
ファイル
デバイス
カメラ
ストリーム再生部
32
SW
ストリームスイッチ部
31
33
SC
ストリームエンジン
GUI
SB
30
TI
TI
トポロジエンジン
CK,PK
SB
CR

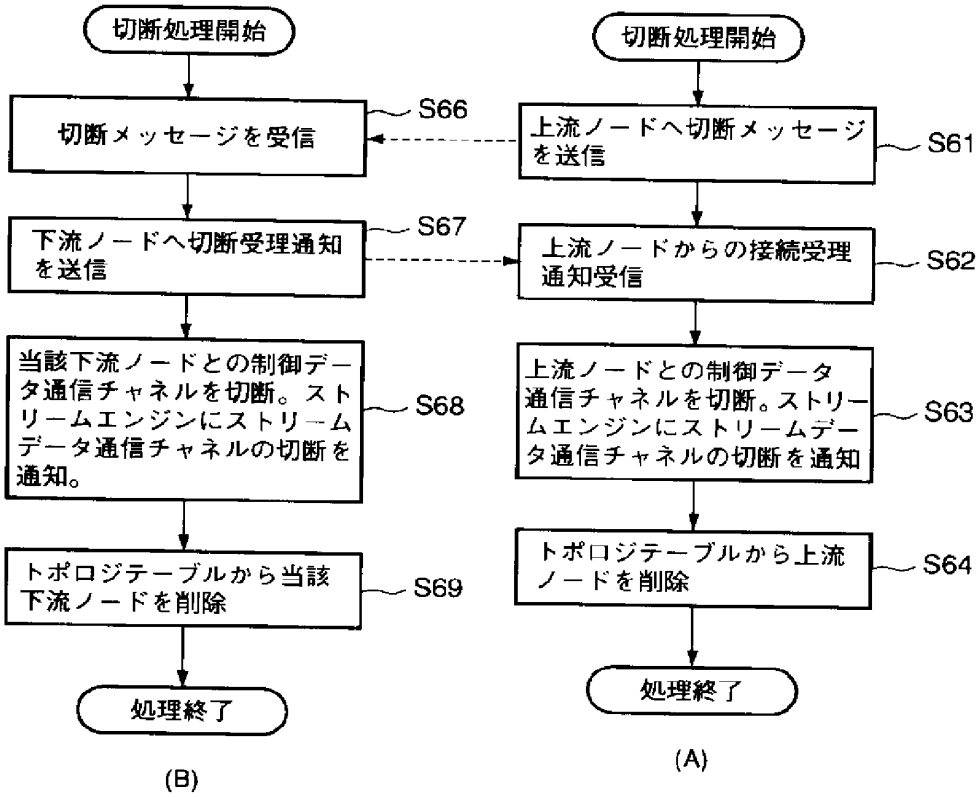
【図１４】


node0
10
node1
10
10
node4
10
10
10
node2
node3
node5

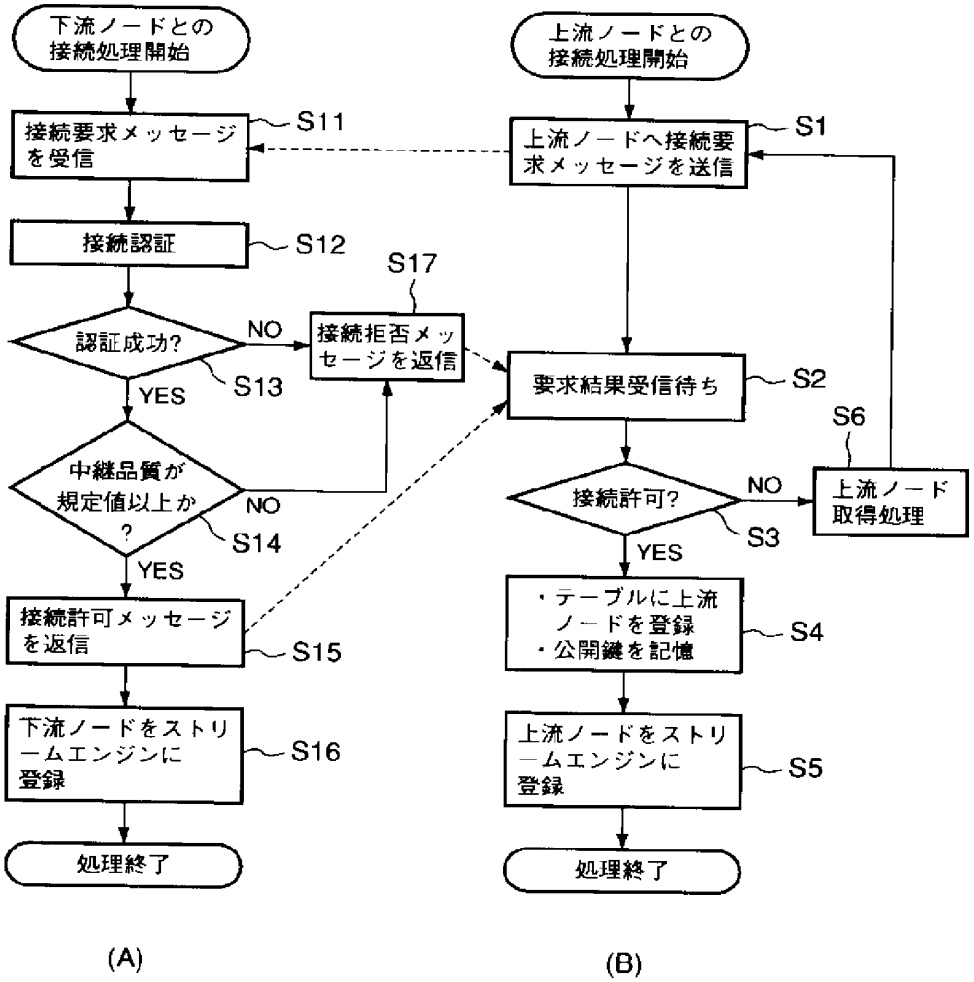
【図７】


31
33
ストリーム
エンジン
SC
GUI
ストリーム
中継制御
331
SB
中継状態
(品質)表示
332
表示装置
70
333
トポロジ
表示
TI
TI
SB
336
公開鍵取得
接続鍵発行
サーバ
71
PK
30
334
接続鍵取得
CK
トポロジ
エンジン
CR
335
上流決定
ノード仲介
サーバ
72

【図１１】


切断処理開始
切断メッセージを受信
S66
下流ノードへ切断受理通知
を送信
S67
当該下流ノードとの制御データ通信チャネルを切断。ストリームエンジンにストリームデータ通信チャネルの切断を通知。
S68
トポロジテーブルから当該下流ノードを削除
S69
処理終了
(B)
切断処理開始
上流ノードへ切断メッセージを送信
S61
上流ノードからの接続受理通知受信
S62
上流ノードとの制御データ通信チャネルを切断。ストリームエンジンにストリームデータ通信チャネルの切断を通知
S63
トポロジテーブルから上流ノードを削除
S64
処理終了
(A)

【図８】




【図１５】

(A)

TI-0

| ノード識別子 | 直接接続している上流ノード識別子 |
|---|---|
| node0 | なし |
| node1 | node0 |
| node4 | node0 |

(B)

TI-1

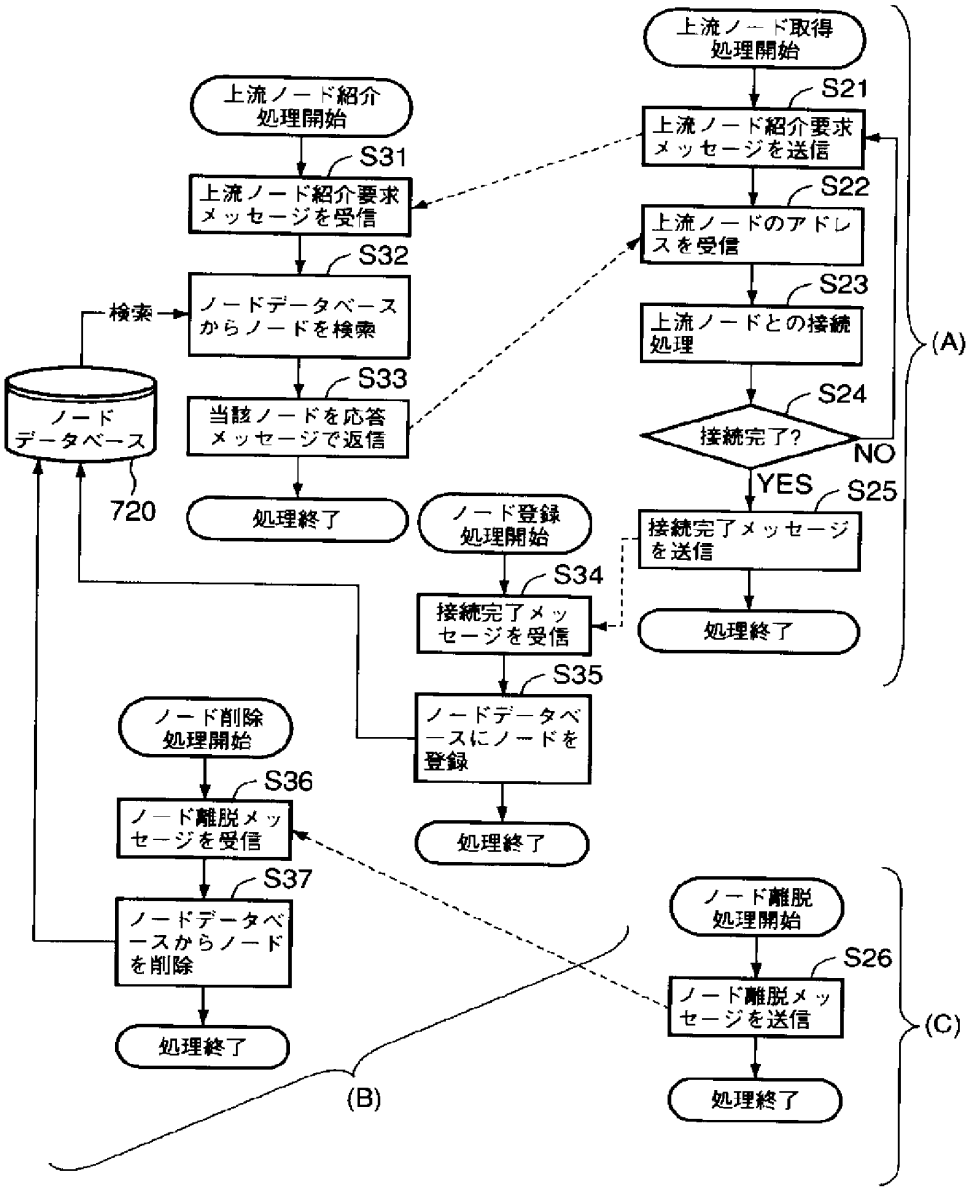
| ノード識別子 | 直接接続している上流ノード識別子 |
|---|---|
| node0 | なし |
| node1 | node0 |
| node4 | node0 |
| node2 | node1 |
| node3 | node1 |

(C)

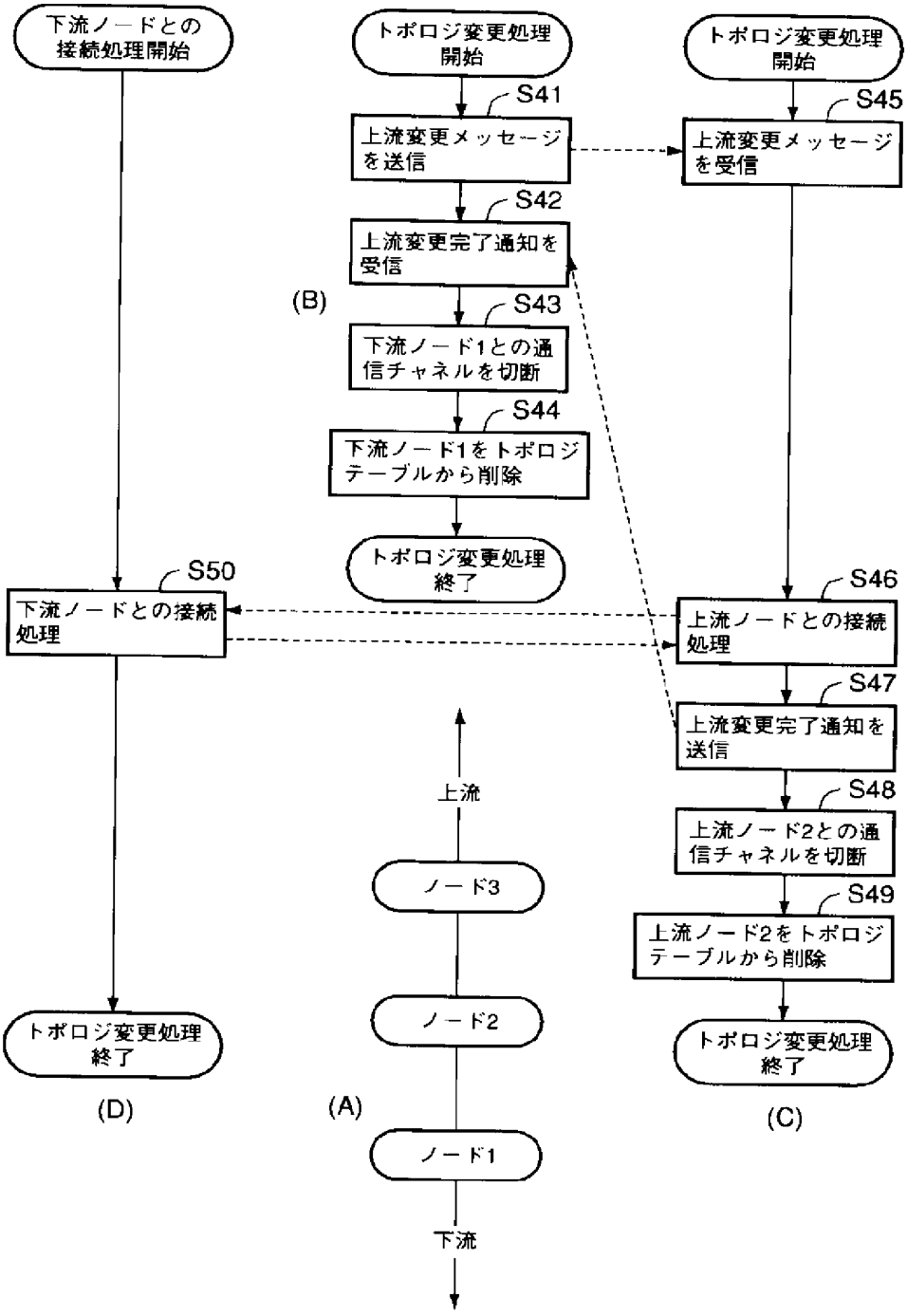
TI-4

| ノード識別子 | 直接接続している上流ノード識別子 |
|---|---|
| node0 | なし |
| node1 | node0 |
| node4 | node0 |
| node5 | node4 |

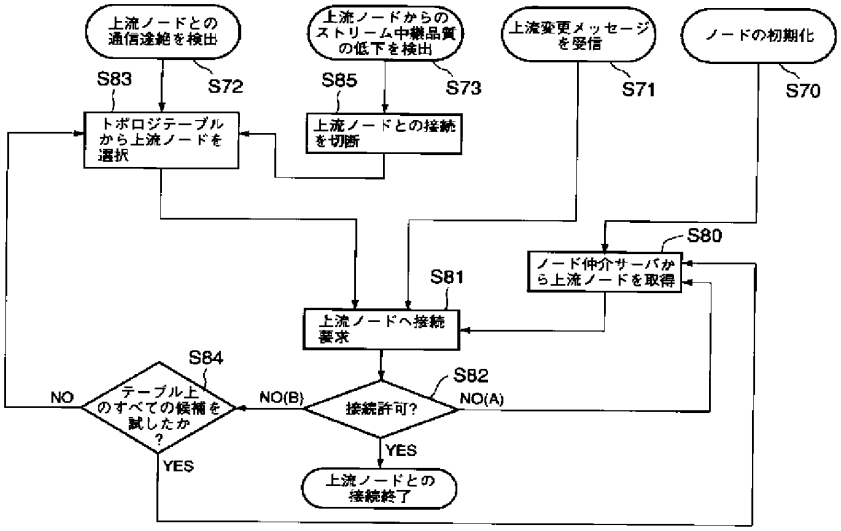
【図９】


上流ノード取得処理開始
S21
上流ノード紹介要求メッセージを送信
S22
上流ノードのアドレスを受信
S23
上流ノードとの接続処理
S24
接続完了?
NO
YES
S25
接続完了メッセージを送信
処理終了
(A)
上流ノード紹介処理開始
S31
上流ノード紹介要求メッセージを受信
S32
検索
ノードデータベースからノードを検索
S33
当該ノードを応答メッセージで返信
処理終了
ノード
データベース
720
ノード登録処理開始
S34
接続完了メッセージを受信
S35
ノードデータベースにノードを登録
処理終了
ノード削除処理開始
S36
ノード離脱メッセージを受信
S37
ノードデータベースからノードを削除
処理終了
(B)
ノード離脱処理開始
S26
ノード離脱メッセージを送信
処理終了
(C)

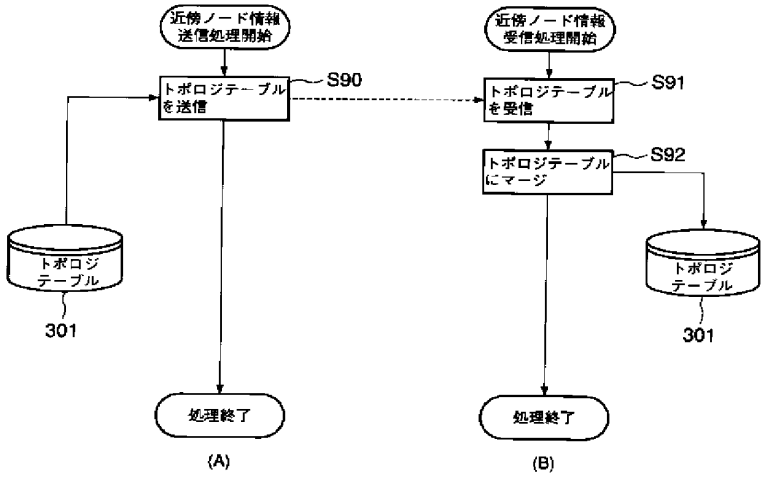
【図１０】


下流ノードとの接続処理開始
トポロジ変更処理開始
S41
上流変更メッセージを送信
S42
上流変更完了通知を受信
(B)
S43
下流ノード1との通信チャネルを切断
S44
下流ノード1をトポロジテーブルから削除
トポロジ変更処理終了
S50
下流ノードとの接続処理
トポロジ変更処理終了
(D)
上流
ノード3
ノード2
(A)
ノード1
下流
トポロジ変更処理開始
S45
上流変更メッセージを受信
S46
上流ノードとの接続処理
S47
上流変更完了通知を送信
S48
上流ノード2との通信チャネルを切断
S49
上流ノード2をトポロジテーブルから削除
トポロジ変更処理終了
(C)

【図１２】




【図１３】




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フロントページの続き

Ｆターム(参考)　5K030 GA13 HA04 HD03 KA05 LC01
LC11

Espacenet

# Bibliographic data: JP2003506765 (A) — 2003-02-18

## VOD FROM A SERVER OR A USER TO ANOTHER USER

**Inventor(s):**

**Applicant(s):**

**Classification:** **- international:** ***G06F12/00; G06F13/00; H04N5/76; H04N5/765; H04N7/173;*** *H04N7/16;* (IPC1-7): G06F12/00; G06F13/00; H04N5/76; H04N5/765; H04N7/16; H04N7/173

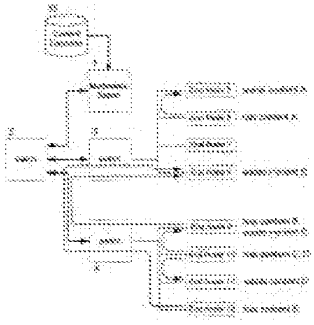
**- cooperative:** **H04N21/4331**; **H04N21/632**; **H04N21/816**; **H04N21/8456**; **H04N7/17336**

**Application number:** JP20010513892 20000802

**Priority number(s):** WO2000US21127 20000802 ; US19990475807 19991230 ; US19990146893P 19990802

**Also published as:** WO0110125 (A1) EP1205073 (A1) AU6619300 (A) CN1377556 (A)

**Abstract not available for JP2003506765 (A)**
**Abstract of corresponding document: WO0110125 (A1)**



A system and method for delivering data to multiple end users (5-12) using distributed storage system connected through a data communications network. The end user equipment for audio or video playback or recording contains a storage unit, such as a magnetic disk. Each storage unit can store data, such as digital video content, i.e. movies, or digital audio content, i.e. songs. The storage unit can also be configured to store portions, or fragments, of digital video or audio content, where the storage location, playback, and recording of digital video or audio content of each storage unit is administered, managed and controlled by a central facility (1). The content for playback of a video or audio content, or portions thereof, may reside on one or more physically separate storage unit, or may also reside on a central storage unit (13).

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（P2003－506765A）
(43)公表日　平成15年２月18日(2003.2.18)

| (51)Int.Cl.[7] | 識別記号 | ＦＩ | | テーマコード(参考) |
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| 12/00 | ５４５ | 12/00 | ５４５Ａ | ５Ｃ０５２ |
| | ５４６ | | ５４６Ｋ | ５Ｃ０５３ |
| Ｈ０４Ｎ　5/76 | | Ｈ０４Ｎ　5/76 | Ｚ | ５Ｃ０６４ |
| 5/765 | | 7/16 | Ａ | |

審査請求　未請求　予備審査請求　有　（全 45 頁）　最終頁に続く

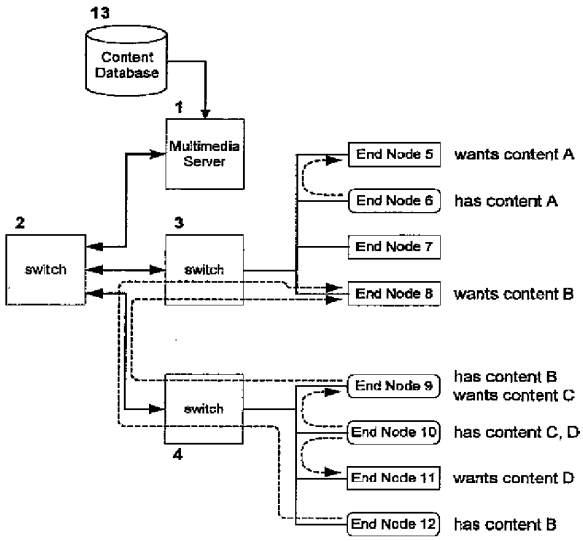
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(86)（22)出願日　平成12年８月２日(2000.8.2)
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(86)国際出願番号　ＰＣＴ／ＵＳ００／２１１２７
(87)国際公開番号　ＷＯ０１／０１０１２５
(87)国際公開日　平成13年２月８日(2001.2.8)
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(54)【発明の名称】　分散型記憶システムを使用してデータを配信するための方法および装置

(57)【要約】
データ通信ネットワークを介して接続された分散型記憶システムを使用して複数のエンド・ユーザにデータを配信するためのシステムおよび方法。オーディオ／ビデオの再生または記録用のエンド・ユーザ機器には、磁気ディスクなどの記憶ユニットが含まれる。各記憶ユニットは、デジタル・ビデオ・コンテンツすなわち映画や、デジタル・オーディオ・コンテンツすなわち音楽などの、データを格納することができる。記憶ユニットは、デジタルのビデオまたはオーディオ・コンテンツの一部、すなわちフラグメントを記憶するように構成することが可能であり、各記憶ユニットのデジタル・ビデオまたはオーディオ・コンテンツの記憶ロケーション、再生、および記録は、中央施設によって監督、管理、および制御される。ビデオまたはオーディオ・コンテンツまたはその一部の再生用コンテンツは、１つまたは複数の物理的に別々の記憶ユニット上に常駐することが可能であり、あるいは中央記憶ユニット上に常駐することも可能である。



【特許請求の範囲】

【請求項１】　データをオン・デマンドで通信ネットワーク内にある要求側のエンド・ユーザ・ユニット（「要求側ＥＵＵ」）に配信するための、データ・オン・デマンド・システムであって、

複数のエンド・ユーザ・ユニット（「ＥＵＵ」）を含み、前記ＥＵＵの少なくとも１つ（「第１のソースＥＵＵ」）が、前記通信ネットワークを介してデータ・ファイルを受け取り、前記データ・ファイルを記憶し、前記通信ネットワークを介して前記データ・ファイルを伝送するように適合されており、

さらに前記データ・オン・デマンド・システムが、前記複数のＥＵＵ間で、前記通信ネットワークを介したデータ・ファイルの伝送に対処するように適合されたサーバを含み、

前記サーバおよび前記第１のソースＥＵＵが、

前記サーバが前記通信ネットワークを介して前記データ・ファイルを前記第１のソースＥＵＵに伝送することを可能にし、

前記第１のソースＥＵＵ内に前記データ・ファイルを記憶し、さらに

前記要求側ＥＵＵから受け取った命令に応答して、前記サーバが、前記第１のソースＥＵＵに前記通信ネットワークを介して前記要求側ＥＵＵに前記データ・ファイルを伝送させることを可能にするように適合された、データ・オン・デマンド・システム。

【請求項２】　さらに前記サーバが、前記第１のソースＥＵＵの前記データ・ファイルのロケーションに関する情報を追跡するように適合された請求項１に記載のデータ・オン・デマンド・システム。

【請求項３】　前記データ・ファイル・システムが、

統合マルチメディア・プログラムと、

統合マルチメディア・プログラムの少なくとも１フラグメントと、

複数の統合マルチメディア・プログラムのフラグメントの組合せのうちの、少なくとも１つを含む請求項１に記載のデータ・オン・デマンド・システム。

【請求項４】　第２のソースＥＵＵをさらに含むシステムであって、

前記データ・ファイルが前記第１のソースＥＵＵによって記憶されたときに、

前記第２のソースＥＵＵが、前記データ・ファイルを受信して記憶するように適合され、

前記第１のソースＥＵＵからの伝送が１つまたは複数の所定の基準に合致した場合に、前記サーバおよび前記第２のソースＥＵＵが、前記第２のソースＥＵＵに、前記データ・ファイルの前記要求側ＥＵＵへの伝送を開始させるように適合された請求項１に記載のシステム。

【請求項５】　前記サーバが、少なくとも１つの所定の基準に基づいて、前記第１のソースＥＵＵに、記憶装置内にある前記データ・ファイルを少なくとも１つの他のデータ・ファイルと置き換えさせるように適合された請求項１に記載のシステム。

【請求項６】　データ通信ネットワークを介して接続された複数のエンド・ユーザ・ユニット（「ＥＵＵ」）に、オン・デマンドでデータ・ファイルの管理および配信を実行するサーバであって、前記サーバが、

中央処理ユニット（「ＣＰＵ」）と、

前記ＣＰＵに動作可能に接続されたメモリとを含み、前記メモリが前記ＣＰＵによって実行されるように適合されたプログラムを含み、

前記ＣＰＵおよび前記メモリが、前記複数のＥＵＵで前記データ・ファイルのロケーションを追跡しながら、少なくとも１つの所定の基準に基づいて記憶するために、複数のデータ・ファイルを前記複数のＥＵＵに分散するように動作可能に適合され、

前記ＣＰＵおよび前記メモリが、少なくとも１つのデータ・ファイルに関する第１のＥＵＵからの要求を受け取るように動作可能に適合され、

前記ＣＰＵおよび前記メモリが、第２のＥＵＵで前記少なくとも１つのデータ・ファイルを探し出し、前記要求に従って、前記少なくとも１つのデータ・ファイルを前記第１のＥＵＵに伝送するように前期第２のＥＵＵに指示するように動作可能に適合されたサーバ。

【請求項７】　前記ＣＰＵおよび前記メモリが、第１のデータ・ファイルと第２のデータ・ファイルの組合せに関する第３のＥＵＵからの要求を受け取るように動作可能に適合され、

前記ＣＰＵおよび前記メモリが、第４のＥＵＵに記憶された前記第１のデータ・ファイルおよび第５のＥＵＵに記憶された前記第２のデータ・ファイルを探し出すように動作可能に適合され、

前記ＣＰＵおよび前記メモリが、前記要求に従って前記第１および第２のデータ・ファイルを前記第３のＥＵＵに伝送するように前記第４および第５のＥＵＵに指示するように動作可能に適合された請求項６に記載のサーバ。

【請求項８】　前記第３のＥＵＵによって要求された前記第１と第２のデータ・ファイルの組合せが、統合データ・ファイルから２つのフラグメントを構成する請求項７に記載のサーバ。

【請求項９】　前記ＣＰＵおよび前記メモリが、複数のデータ・ファイルを探し出して管理し、要求に従って前期データ・ファイルの伝送を整列させるように動作可能に適合された請求項７に記載のサーバ。

【請求項１０】　前記ＣＰＵおよび前記メモリが、前記複数のＥＵＵ間での使用量情報を追跡するように動作可能に適合され、

前記ＣＰＵおよび前記メモリが、前記使用量情報に応答して記憶するために、前記複数のＥＵＵ間でデータ・ファイルを再分散するように動作可能に適合され、

前記ＣＰＵおよび前記メモリが、新しいデータ・ファイルが使用可能なときに、記憶するために前記新しいデータ・ファイルを前記複数のＥＵＵ間で分散するために追加するように動作可能に適合された請求項６に記載のサーバ。

【請求項１１】　データ・オン・デマンド・システム用のエンド・ユーザ・ユニットであって、

プロセッサと、

データ・ファイルを受け取るためにデータ通信ネットワークに接続されるように適合され、さらに前記データ通信ネットワークを介して前記データ・ファイルの少なくとも一部をサーバが指定した第２のエンド・ユーザ・ユニットに伝送するようにも適合されたモデムと、

データ通信ネットワークに接続されたサーバからの指示に応答して、前記データ・ファイルを記憶するように適合された記憶ユニットとを含む、エンド・ユー

ザ・ユニット。

【請求項１２】　少なくとも１つのデータ・ファイルを、通信ネットワークを介して中央記憶装置から複数のエンド・ユーザ・ユニット（「ＥＵＵ」）へオン・デマンドで配信する方法であって、

ａ）前記中央記憶装置で少なくとも１つのデータ・ファイルを記憶すること、

ｂ）前記データ・ファイルの少なくとも一部を前記第１のＥＵＵに伝送することによって、第１のＥＵＵを初期設定すること、

ｃ）前記第１のＥＵＵで前記データ・ファイルの一部を記憶すること、

ｄ）前記データ・ファイルの一部のロケーションに関する情報を追跡すること、

ｅ）第２のＥＵＵが前記データ・ファイルに関する要求を発行したときに、前記データ・ファイルの一部に関するロケーションを決定すること、

ｆ）前記第１のＥＵＵに記憶された前記データ・ファイルの一部に関して、前記第１のＥＵＵに指示を発行すること、および

ｇ）前記指示を受け取った時点で、前記第１のＥＵＵが前記データ・ファイルの一部を前記第２のＥＵＵに伝送することを含む方法。

【請求項１３】　前記方法が、

ａ）前記データ・ファイルの少なくとも一部を記憶するために第３のＥＵＵに伝送することによって、第３のＥＵＵを初期設定すること、

ｂ）前記第３のＥＵＵで前記データ・ファイルのロケーションに関する情報を追跡すること、

ｃ）前記第１のＥＵＵから前記第２のＥＵＵへの伝送を監視すること、

ｄ）前記第１のＥＵＵから前記第２のＥＵＵへの伝送が所定の基準を下回る場合、前記第２のＥＵＵへの前記データ・ファイルの一部の伝送に関して前記第３のＥＵＵに指示を発行し、前記第１のＥＵＵにその伝送を終了させる指示を発行すること、および

ｅ）前記指示を受け取った時点で、前記第３のＥＵＵが前記データ・ファイルの一部を前記第２のＥＵＵに伝送することをさらに含む請求項１２に記載の方法。

【請求項１４】　少なくとも１つのデータ・ファイルを、通信ネットワークを介して複数のエンド・ユーザ・ユニット（「ＥＵＵ」）のうち少なくとも１つへオン・デマンドで配信する方法であって、

ａ）前記通信ネットワークを介してアクセス可能な複数のデータ・ファイルを用意すること、

ｂ）前記複数のデータ・ファイルを記憶するために複数のＥＵＵに分散すること、

ｃ）前記複数のＥＵＵでの前記データ・ファイルのそれぞれの記憶ロケーションに関する情報を追跡すること、

ｄ）要求側ＥＵＵが前記複数のデータ・ファイルのうち少なくとも１つに関する要求を発行した場合、前記複数のデータ・ファイルのうちの前記少なくとも１つを記憶している少なくとも１つのＥＵＵを、少なくとも１つの所定の基準に基づいて、前記複数のＥＵＵから探し出すこと、および

ｅ）識別されたＥＵＵに、前記少なくとも１つのデータ・ファイルを前記要求側ＥＵＵに伝送させることを含む方法。

【請求項１５】　ステップｄ）の識別に関する前記所定の基準が、

前記複数のＥＵＵのそれぞれの間での、前記第２のＥＵＵへの伝送の品質と、

前記第２のＥＵＵを基準にした前記第１の複数のＥＵＵそれぞれの近さと、

第２の複数のＥＵＵを基準にした、前記複数のＥＵＵそれぞれのニーズとのうち、少なくとも１つの基準を含む請求項１４に記載の方法。

【請求項１６】　前記複数のデータ・ファイルが、マルチメディア・プログラムおよびデータを含む請求項１４に記載の方法。

【請求項１７】　マルチメディア・プログラムを、通信ネットワークを介してリモート記憶装置から複数のエンド・ユーザ・ユニット（「ＥＵＵ」）へオン・デマンドで配信する方法であって、

ａ）前記リモート記憶装置で少なくとも１つのマルチメディア・プログラムを記憶するステップと、

ｂ）前記マルチメディア・プログラムの少なくとも第１の部分を前記第１のＥＵＵに伝送することによって、第１のＥＵＵを初期設定するステップと、

ｃ）前記第１のＥＵＵで前記マルチメディア・プログラムの前記第１の部分を記憶するステップと、

ｄ）前記マルチメディア・プログラムの少なくとも第２の部分を前記第２のＥＵＵに伝送することによって、第２のＥＵＵを初期設定するステップと、

ｅ）前記第２のＥＵＵで前記マルチメディア・プログラムの前記第２の部分を記憶するステップと、

ｆ）前記の第１のＥＵＵおよび第２のＥＵＵで、前記マルチメディア・プログラムの前記第１および第２の部分の記憶ロケーションに関する情報を追跡するステップと、

ｇ）第３のＥＵＵが前記マルチメディア・プログラムに関する要求を発行したときに、前記マルチメディア・プログラムの前記第１および第２の部分を前記第３のＥＵＵに伝送するように対処するステップと、

ｈ）前記マルチメディア・プログラムの前記第１および第２の部分を受け取った時点で、ダウンロードするために前記第３のＥＵＵが前記マルチメディア・プログラムをアセンブルするステップとを含む方法。

【請求項１８】　前記マルチメディア・プログラムが、ビデオ・プログラム、オーディオ・プログラム、または映画プログラムのうち少なくとも１つを含む請求項１７に記載の方法。

【請求項１９】　前記マルチメディア・プログラムの各部分が、所定の暗号化キーによって暗号化される請求項１７に記載の方法。

【請求項２０】　複数のクライアントおよびサーバを備えたデータ通信ネットワークにおいて、複数のデータ・ファイルから少なくとも１つのデータ・ファイルをオン・デマンドで第１のクライアントに配信する方法であって、

ａ）前記複数のデータ・ファイルを所定の分散スキームに基づいて記憶するために、前記複数のクライアントおよびサーバのうち少なくとも１つに分散するステップと、

ｂ）前記データ・ファイルをそれぞれ、そのロケーションに関して追跡するステップと、

ｃ）前記複数のデータ・ファイルのうち１つに関する要求を前記第１のクライ

アントから受け取るステップと、
ｄ）前記クライアントおよび前記サーバのうち少なくとも１つから前記要求されたデータ・ファイルを探し出すステップと、
ｅ）前記クライアントおよび前記サーバのうち少なくとも１つに、前記要求されたデータ・ファイルを前記第１のクライアントに伝送するように指示するステップとを含む方法。
【請求項２１】　前記所定の分散スキームが、クライアントおよびサーバのロケーション、ならびに複数のデータ・ファイルのうち少なくとも１つに基づいている請求項２０に記載の方法。
【請求項２２】　通信ネットワークを使用してＶＯＤサービスを実行する方法であって、
ａ）前記通信ネットワーク内にある少なくとも１つのサーバを介してアクセス可能な複数の映画を用意するステップと、
ｂ）複数のセットトップ・ボックス（「ＳＴＢ」）を複数のクライアントに分散し、所定の要求に応じて前記映画をＳＴＢの少なくとも一部で記憶、表示、および伝送することができるステップと、
ｃ）前記ＳＴＢ全体および前記少なくとも１つのサーバで、複数の映画のフラグメントまたは全体を記憶し、前記映画のフラグメントのロケーションの追跡を続けるステップと、
ｄ）前記複数の映画からの映画に関してクライアントの１つから要求があった時点で、前記映画のフラグメントまたは全体を探し出すステップと、
ｅ）前記ＳＴＢおよび前記少なくとも１つのサーバの中から前記映画のフラグメントまたは全体を探し出した時点で、前記映画のフラグメントまたは全体を要求側クライアントに配信させるステップとを含む方法。

【発明の詳細な説明】

【０００１】

発明者：Ｒａｎｄａｌｌ　Ｍ．Ｃｈｕｎｇ

（関連出願の相互参照）

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【０００２】

（発明の分野）

本発明はデータ通信網に関し、より詳細には、分散型記憶ユニットを使用してインターネットなどのネットワークを介してデータを配信するための方法および装置に関する。

【０００３】

（背景技術）

ＶＣＲの出現以来、ムービー・オン・デマンド・システムによって、視聴者がビデオ店へ足を運ぶ必要性を軽減することが、社会全体の希望であった。「ビデオ・オン・デマンド」（「ＶＯＤ」）システムは、視聴者が任意の映画やビデオ・プログラムを選択し、次いでビデオのコンテンツを、即時、数時間後、または数日後のいずれかの要求時に視聴できるようにするものである。ビデオの配信は純粋には電子的であり、その結果、ビデオ・テープまたはビデオ・ディスクなどの物理的な媒体を購入するか、またはビデオ店で借りて視聴した後に返却する必要がない。

【０００４】

ケーブル会社は、自社のケーブル顧客に対して何らかの形でビデオ配信を実施してきた。ただし、記憶スペースおよび帯域幅の制限により、映画の選択はかなり制限され、視聴者はケーブル会社が指定した時間にしか映画を見ることはできなかった。古い「ゴッドファザー」の映画を水曜日の午後に見たいと思う人にとっては、不運である。したがってケーブル会社が提供するシステムは、真のＶＯ

Ｄシステムではなく、ましてや広範囲にわたる視聴者に好適な柔軟性を備えたシステムとは言えない。

【０００５】

数多くの視聴者に対して実際のビデオ・オン・デマンド・システムを実施することは、困難であり費用がかかる。典型的には、何百何千もの異なる最終消費者に対して、複数の同時連続ストリームのオーディオまたはビデオ・コンテンツを配信することができるマルチメディア・サーバが必要である。理想的には、顧客は何百もの映画や音楽のライブラリから自分のコンテンツを選択することができることである。ただし、典型的なハード・ディスク・ドライブは、省略なしの映画を２，３本しか保持できない可能性があり、すなわちマルチメディア・サーバは、５０またはそれ以上のディスク・ドライブを含まなければいけないことになる。図１Ａは、「ビデオ・オン・デマンド」を提供するためのこうした従来のケーブル・ブロードキャスト・システムを示す図である。

【０００６】

大規模な共用マルチメディア・サーバを用いることにおける他の難点は、デジタル・マルチメディア・コンテンツの多重ストリームを処理および伝送する必要があることである。標準解像度の圧縮テレビジョン信号は、平均毎秒約４メガビットのデータ速度で伝送される。１台のマルチメディア・サーバが、１００の異なるプログラムを同時に処理しなければならない場合、必要な総帯域幅の平均は毎秒４００メガビットとなる。さらにこの大量のデータは、不連続性が容易に感知されることなく１００人の視聴者に伝送されなければ、視聴者の体験を台無しにしてしまうことになる。したがって、サービス品質（ＱｏＳ）を保証しながらこうしたデータを中央サーバから多くのユーザへ高速で伝送することをサポートするためのネットワークは非常に高価であり、誰もが構築できるものではなかった。

【０００７】

ケーブル・モデムを使用するインターネットを介した通信の出現により、ケーブル・モデムがケーブル会社によるビデオ・オン・デマンドの提供を可能にするであろうと提案されてきた。インターネットに結合されたケーブル・モデムは、

ケーブル会社ができなかったこと、すなわちインターネットを使用したビデオ・オン・デマンド・システムを達成できると期待されてきた。

【０００８】

図１Ｂは、ケーブル・モデムを備えたケーブルＴＶブロードキャスト・システムを介して、ビデオ・オン・デマンドがどのようにして都市部で提供されるかを示す図である。このシステムでは、アナログＴＶ信号が衛星放送用パラボラ・アンテナ１によって受信される。アナログＴＶ信号は、信号結合器１０を介して、インターネットからのビデオ・オン・デマンド信号およびデジタル通信信号と結合される。

【０００９】

図１Ｂでは、ビデオ・オン・デマンド信号はデジタルであるが、アナログ信号も可能である。インターネット公衆ネットワーク２上にあるＷｏｒｌｄ　Ｗｉｄｅ　Ｗｅｂページなどのデジタル・コンテンツは、ルータ３を介してシステムに接続される。ルータ３は、インターネット・ネットワークとたとえばイーサネット（登録商標）・ネットワーク・スイッチ４との間などのように、ネットワーク間からのパケット・データを変換する際に使用される。イーサネット・ネットワーク・スイッチ４は、インターネット・ルータ３、ファイバ戻りチャネル復調器５、ファイル・サーバ６、マルチメディア・サーバ８、および変調器９との間でデータを送受信する。ファイバ戻りチャネル復調器５は、顧客構内設置機器（「ＣＰＥ」）から光ファイバ１１を介して戻ってきた信号をデジタル形式に変換するものであり、この信号はインターネットに送られるであろう。ファイル・サーバは、Ｗｏｒｌｄ　Ｗｉｄｅ　Ｗｅｂページを保持するため、またはインターネット情報のキャッシュに使用することができる。マルチメディア・サーバは、コンテンツ・データベース７を制御し、複数の映画や音楽を同時に読み取ることができる。コンテンツ・データベースは、デジタル化されたすべての映画や音楽を保持する。マルチメディア・サーバまたはイーサネット・スイッチからエンド・ユーザに送られるデジタル・データは、衛星放送用パラボラ・アンテナ１からのアナログＴＶ信号と結合される前に、デジタル／アナログ変調器９を通すことができる。

【００１０】

さらに図１Ｂを参照すると、光ファイバ１１と同軸ケーブル１３との間を通る信号は、同軸／光変換器１２によって変換することができる。アナログＴＶ信号は、ＴＶ受像機１７に伝送するためにセットトップ・ボックス１６を介して周波数変換され、デジタル信号は、ＰＣ１５で使用するためにケーブル・モデム１４によってデジタルに変換される。単一住居にある顧客構内設置機器１８（ＣＰＥ）は１セットの機器を、他の住居では他のＣＰＥ１９セットを収容し、それぞれの顧客が異なるビデオ、オーディオ、またはデータ・コンテンツを視聴することが可能である。

【００１１】

何百人、何千人の顧客が１セットのプロバイダ機器によって処理されるのは、珍しいことではない。これは、潜在的にマルチメディア・サーバが、それぞれの顧客への様々な映画や音楽のデータ・ストリームを同時に処理しなければならないことを意味する。何千人もの顧客がありマルチメディア・サーバが１台しかなければ、これは実質上不可能である。解決策の１つは、複数のマルチメディア・サーバを使用し、それぞれが顧客のサブセットを処理することができるようにすることであるが、これではすべての顧客を処理すると経費が倍増してしまう。その他の問題は、非常に大量のマルチメディア・データを、集中型マルチメディア・サーバやサーバ・グループから送信しなければならないということである。それぞれの顧客は、マルチメディア・サーバからの異なるビデオを時間的に異なる地点で（たとえば、ビデオの最初、中程、終わりを）視聴することがあるので、それぞれのビデオは別々のチャネルとして扱われる。通常のブロードキャスト・チャネルに加えて何百何千にも上る別々のチャネルの帯域幅は、現在の伝送経路が処理できる域を超えるものである。

【００１２】

したがって、複数の受信者がいつでも好きな時間に同じまたは異なるコンテンツを受信できるようなオン・デマンドのデータ配信システムが望ましい。

【００１３】

また、こうしたオン・デマンドのデータ配信システムが、サーバの帯域幅また

は伝送インフラストラクチャを使い尽くすことのないことが望ましい。

【００１４】

（発明の概要）

データ通信ネットワークを介して接続された分散型記憶システムを使用して複数のエンド・ユーザにデータを配信するためのシステムおよび方法が開示され、オーディオ／ビデオの再生または記録用のエンド・ユーザ機器には、磁気ディスクなどの記憶ユニットが含まれる。各記憶ユニットは、デジタル・ビデオ・コンテンツすなわち映画や、デジタル・オーディオ・コンテンツすなわち音楽などの、データを格納することができる。記憶ユニットは、デジタルのビデオまたはオーディオ・コンテンツの一部、すなわちフラグメントを記憶するように構成することが可能であり、各記憶ユニットのデジタル・ビデオまたはオーディオ・コンテンツの記憶ロケーション、再生、および記録は、中央施設によって監督、管理、および制御される。ビデオまたはオーディオ・コンテンツまたはその一部の再生用コンテンツは、１つまたは複数の物理的に別々の記憶ユニット上に常駐することが可能であり、あるいは中央記憶ユニット上に常駐することも可能である。

【００１５】

コンテンツは、再生のために、１つまたは複数の物理的に分散された記憶ユニットから読み出し、１つまたは複数の他の物理的に別々のサイトに送信することも可能であり、映画などのコンテンツの作品全体が、等しいかまたは異なるサイズの部片に分割され、１つまたは複数の部片を複数の物理的に別々の記憶ユニット上に記憶することができる。部片の記憶場所、伝送の順序、伝送の優先順位、および部片の宛先の割当ては、中央で監視および制御される。コンテンツは、同じコンテンツを近い将来他の顧客に配信する必要性を予測して、表示の必要のない記憶ユニットにも同時に伝送することが可能である。これによって、新しいリリースなど一定のプログラムの大量のダウンロードが予測される場合に、ピーク時またはオフピーク時など、いつでもリソースの動的な割振りが可能になる。

【００１６】

さらに、記憶ユニット間を接続するデータ通信ネットワークは、有線または無線のいずれも可能である。ケーブル・モデムでインターネットが使用され、さら

に他の形式のネットワーク接続がまったく同様に動作することができる。

【００１７】

当分野の技術者であれば理解されるように、以下の記述で開示される内容は、ローカルまたはリモートのいずれかでディスク・ドライブまたはファイル・サーバに結合された「セットトップ・ボックス」であり、この「セットトップ・ボックス」が他の「セットトップ・ボックス」のファイル・サーバとして動作する。したがって、集合体におけるセットトップ・ボックスは、それぞれのメンバ・セットトップ・ボックスに対して大規模であるがなお分散型の記憶設備として働くことができる。記憶されたプログラムまたはファイルは、複数のセットトップ・ボックスを介して分散して記憶または伝送するために、任意のサイズの部片にフラグメント化することもできる。さらに、他のコンピュータまたはセットトップ・ボックスのファイル・サーバとしても動作可能なディスク・ドライブを収容したパーソナル・コンピュータについても開示する。そのファイルは、複数のコンピュータまたはセットトップ・ボックスを介して分散型の記憶または伝送を行うために、任意のサイズの部片にフラグメント化することができる。

【００１８】

（好ましい実施形態の詳細な説明）

分散型記憶システムを使用してデータを配信するための方法および装置について開示する。以下の説明において、本発明は、サーバ、スイッチ、ルータ、データベース、エンド・ノード、ネットワーク、およびインターネットを用いて記載されており、これらは当分野の技術者が互いの情報交換で典型的に使用する用語である。また、当分野の技術者であれば、「データ」という用語が、オーディオまたはビデオのコンテンツ、マルチメディア・コンテンツ、あるいは単に通信ネットワークを通して伝送されるバイナリ・ビットを表すことができるものであることを理解されよう。

【００１９】

前述のように、マルチメディア・サーバの帯域幅要件を減らすことができる方法の１つは、コンテンツの第１の伝送をキャッシュするために、主ネットワーク伝送経路に沿った記憶ユニットを有することである。他のエンド・ユーザが将来

同じコンテンツを要求した場合に、キャッシュしている記憶ユニットから処理することができる。

【００２０】

図２Ａは、単一のマルチメディア・サーバが、１００人のユーザに対して同時にＡＶコンテンツを処理することを要求された場合の方法の一例を示す図である。一部のコンテンツの人気が高いために、多くの顧客が同じＡＶコンテンツを視聴する場合がある。たとえば、新作映画は数年前の映画よりも人気が高い可能性がある。ただし、ケーブル会社が番組を提供する場合などのように決められたスケジュールに従うのではなく、それぞれの顧客が自分の選択した時間に映画の視聴を開始できるようにすることが好ましい。すなわち、同じ映画が複数の顧客によって視聴されるが、映画は時間的に異なる地点で視聴される可能性があるため、データを重複して送信しなければならない。

【００２１】

図２Ｂは、配信請求を容易にするために、マルチメディア・サーバと顧客との間にキャッシュ・メモリを挿入する方法を示す図である。各キャッシュ・メモリは、全ての顧客のより小さなグループを処理する。ＡＶコンテンツが以前にグループのキャッシュ・メモリ内に記憶されていない場合、中央マルチメディア・サーバによって提供されることになる。ＡＶコンテンツは顧客に伝送され、グループ・キャッシュ・メモリにも一時的に記憶される。グループ内の他の顧客が同じＡＶコンテンツを要求した場合、ＡＶコンテンツは依然としてキャッシュ・メモリ内に常駐しているため、キャッシュ・メモリはこのコンテンツを容易に提供することができる。これによって、中央マルチメディア・サーバの負荷が減少し、サーバが使用する帯域幅が減少する。ただし、この方法には明らかな問題がある。キャッシュ・メモリが小さすぎると、ＡＶコンテンツのほんの一部だけしか記憶することができず、コンテンツへの要求の多くはキャッシュを迂回してしまう。これによって、帯域幅および中央マルチメディア・サーバへの負荷を減少させたことによる効果が低下する。しかし、キャッシュ・メモリを大きくすると経費が増加してしまう。

【００２２】

以下で開示するように、本発明は、エンド・ノード側の記憶ユニット・システムをマルチメディア・コンテンツの主記憶装置として動作させることによって、デジタル・マルチメディアなどのデータを分散する従来の方法に付随した問題を解決する方法を提供することを対象としている。マルチメディア・コンテンツの配信を増加させるために以前からの集中型マルチメディア・サーバを使用することもできるが、エンド・ノードからのマルチメディア・データに対する要求の大部分は、他方のエンド・ノード側にある個々の記憶ユニットで処理されることになる。

【００２３】

こうした分散型サーバ・システムを、時間が重要なマルチメディア・コンテンツを分散するのに使用すれば、現在の集中型サーバ・システム固有の問題を解決することができる。以下で説明するように、図３Ａおよび３Ｂは、集中型サーバを使用した従来のシステムを示す図であり、図４Ａ、４Ｂ、および４Ｃは、本発明に従った分散型サーバ・システムを示す図である。

【００２４】

図３Ａは、ユーザ・サイト側にインストールすることができる、従来のエンド・ノード機器を簡略的に示す構成図である。これは通常、ＴＶに結合されたセットトップ・ボックス（「ＳＴＢ」）である。ＳＴＢは、通常、ケーブル・モデムならびにデジタルのビデオおよびオーディオ圧縮解除回路を有する。図３Ｂに示されるように、マルチメディア・サーバ１は、すべてのマルチメディア・コンテンツを記憶するコンテンツ・データベース１３を制御する。ネットワーク・スイッチ２は、サーバ、ネットワーク・スイッチ３、およびネットワーク・スイッチ４の間でのデータ伝送を制御する。ネットワーク・スイッチ３は、ネットワーク・スイッチ２からのデータをユーザ・エンド・ノード５～８を介するように切り替え、ネットワーク・スイッチ４は、ネットワーク・スイッチ２からのデータをユーザ・エンド・ノード９～１２を介するように切り替える。この例では、エンド・ノード５、８、９、および１１が集中型サーバ１からのマルチメディア・データを受信している。サーバ１とスイッチ２は、高額な高帯域幅接続を必要とする可能性のある長距離電話によって隔てられている場合がある。エンド・ノード

５および８向けのコンテンツ・データ・ストリームＡおよびＢは、スイッチ２からスイッチ３に向けて送られ、エンド・ノード９および１１向けのコンテンツ・データ・ストリームＣおよびＤは、スイッチ２からスイッチ４に向けて送られる。次いでスイッチ３は、受け取ったデータをエンド・ノード５および８に向けて送り、スイッチ・ユニット４は、受け取ったデータをエンド・ノード９および１１に向けて送る。このシステムでは、Ａ～Ｄまでの４つのデータ・ストリームがすべて、コンテンツ・データベース１３から発せられ、サーバ１を介し、スイッチ２を介した後、スイッチ３および４を介したものでなければならない。マルチメディア・データの時間を重要とする性質により、コンテンツ・データベース１３とエンド・ユーザとの間の構成要素とネットワークとのすべての相互接続は、待ち時間が短く、かなりの高速でなければならない。図３Ａおよび３Ｂに示されたシステムは、特に多数のエンド・ノードが同時にデータを要求した場合には、明らかに限界があろう。

【００２５】

図４Ａは、ＴＶでデジタル・ビデオを視聴するための、消費者向けエンド・ノード機器を示す図である。そのＳＴＢには、ケーブル・モデム、ディスク記憶装置などの記憶ユニット、ならびにデジタルのビデオおよびオーディオ圧縮解除回路が含まれる。もちろん、ケーブルからのプログラムを表示するためのＴＶもある。図４Ｂは、たとえばディスク記憶装置などの記憶ユニットを備えたＰＣにデータを送るための、ケーブル・モデムまたはＤＳＬモデムのいずれかを使用して、デジタル・ビデオを視聴するためのＰＣ向け機器を示す図である。

【００２６】

図４Ｂに示されるようなＰＣベースのエンド・ノード機器では、そのオペレーションは、Ｒｅａｌ　Ｔｉｍｅ　Ｐｒｏｔｏｃｏｌ（ＲＴＰ）およびＲｅａｌ　Ｔｉｍｅ　Ｓｔｒｅａｍｉｎｇ　Ｐｒｏｔｏｃｏｌ（ＲＴＳＰ）と呼ばれるいくつかのインターネット・プロトコルをサポート可能な、ＳｕｎのＪａｖａ（登録商標）　Ｍｅｄｉａ　Ｆｒａｍｅｗｏｒｋ（ＪＭＦ）で作成されたソフトウェアによって制御することができる。当分野ではこれらのソフトウェア・プログラムは通常「既製品」であり、当分野の技術者はその機能についてもよく理解してい

る。Ｊａｖａプログラムは、データの伝送を容易にするためにＪＭＦライブラリを使用して書かれており、これはエンド・ノードを送信することをサポートし、他のプログラムはエンド・ノードを受け取るのをサポートするようにプログラムすることができる。当分野の技術者であれば、ソフトウェアをＰＣが調整タスクを制御するように作成できることも理解されよう。

【００２７】

現在では、デモンストレーションおよびプロトタイプ・ユニットの場合、受信側ＰＣを実行する人物がｈｔｔｐ：／／ｗｗｗ．ｊａｖａｓｏｆｔ．ｃｏｍでのダウンロードに使用可能なＳｕｎのＪａｖａ　Ｄｅｖｅｌｏｐｍｅｎｔ　Ｋｉｔ（ＪＤＫ）ソフトウェアをインストールし、その後その人物が、たとえばサービス提供業者からの電子メールを介して、受信ソフトウェアを取得することができる。

【００２８】

エンド・ノード機器のオペレーション用であるソフトウェアの製品バージョンでは、エンド・ユーザは提供業者のＷｅｂサイトを訪れ、受信／送信ソフトウェアをオンラインでインストールすることができる。自動開始ソフトウェア・ルーチンをＰＣの起動ディレクトリにインストールすることも可能であって、その結果、ＰＣの電源がオンになるかまたはリブートされたときに、受信／送信ソフトウェアを起動させることができる。何人かが単一のＰＣを共用している場合があるので、インストール・プログラムが特殊ファイルに個人化情報を記憶し、ＰＣおよび現在のＰＣユーザを識別することも可能である（この特殊ファイルは「ｃｏｏｋｉｅ．」ファイルとして一般に知られている）。

【００２９】

次に、エンド・ノード機器が起動時にどのように初期設定されるかを説明する。当分野の技術者であれば、本発明に従って自らの分散システムを開発しながら、自分自身の初期設定ルーチンおよびプロトコルを容易に考案できることに留意されたい。以下の考察は、例示のために示したものにすぎない。起動時に、エンド・ノード機器側、たとえばＰＣに常駐する受信／送信ソフトウェアは、サービス・プロバイダのＷｅｂサイトにある制御ソフトウェアにメッセージを送信し、

要求があれば受信または送信を行う準備ができていることを肯定すると共に、識別情報を送信することができる。サービス・プロバイダの制御ソフトウェアは、この肯定応答を受信した時点で、特定のＰＣが使用可能であることを知る。

【００３０】

エンド・ユニットが使用可能であることをサービス・プロバイダのサーバがいったん知ると、以下の処理を実行するためにコマンドとデータを送信することができる。

・エンド・ユニットがコマンドとデータを受け取って新しいコンテンツを追加する。

・エンド・ユニットがコマンドを受け取って古いコンテンツを削除する。

・エンド・ユニットがコマンドを受け取って既存のコンテンツを伝送する。

・既存のコンテンツの不正変更をチェックするか、または他の保守タスクを実行する。

【００３１】

一実施形態では、制御ソフトウェアは特定のＰＣが使用不能になったことを知る必要が生じることがある。このシナリオは、ユーザがＰＣをシャットダウンしたとき、ＰＣがクラッシュしたとき、ユーザの電源が故障したとき、またはケーブル・ネットワークが単に業務を停止したときに生じる可能性がある。ユーザがＰＣをスムースに、すなわち不意にではなくシャットダウンした場合、ＰＣ側の制御ソフトウェアにシャットダウンが通知され、これ以上使用できない旨のメッセージをサーバに返信することができる。

【００３２】

ＰＣがクラッシュしたか、またはプロバイダのサーバへの通知なしに使用可能性が除去された場合、分散システムは視聴しているユーが気付くことなく回復することが好ましい。たとえば他のエンド・ユーザ側の視聴者が映画を見たいために、一連の伝送がセットアップされると、サーバは考えられるすべてのエンド・ユーザが使用可能であるか否かを即時にチェック、たとえばポーリングすることができる。いずれかのエンド・ノード・ユニットが応答しない場合、次いでサーバは、そのエンド・ノード・ユニットを使用不能としてマークし、他のエンド・

ノード・ユニットと置き換えることができる。この初期伝送リストは、その後常に、使用可能であることを確認したエンド・ノード・ユニットを起動する。

【００３３】

いったん映画が開始されると、受信側ＰＣは、一定時間までにそれぞれの送信側ＰＣからのデータを予測するように構成することができる。１つのＰＣが予定時間までにデータを配信しない場合は、クラッシュの可能性があるため、受信側ＰＣはプロバイダのサーバに通知することができる。その後サーバは、代わりのエンド・ユニットに伝送リストの残りの部分を与え、その代わりのユニットのインターネット・アドレスを受信側ユニットに通知することによって、即時に他のエンド・ユニットに置き換えることができる。その移行を容易にするために、プロバイダは、バックアップ・サーバを維持することが可能であり、これは、代わりのエンド・ユニットが最高速度にいたるまで、遅延したコンテンツを数秒間受信側エンド・ユニットに提供するものである。

【００３４】

次に図４Ｃを参照する。図４Ｃに示されるように、コンテンツ・データベース１３は、分散システム全体にその仕事の一部をオフロードできるようにセットアップされる。代わりにすべてのマルチメディア・データは、各ユーザ・エンド・ノード内にあるローカルの記憶ユニット間で分散される（図示せず）。すべてのユーザ・エンド・ノードがローカルの記憶ユニットを有する必要はないが、記憶ユニットを有し分散に参加するユーザ・エンド・ノードが多ければ多いほど、システム性能は向上する。ここでマルチメディア・サーバ１は集中型管理者として動作し、ユーザ・エンド・ノード間でマルチメディア・コンテンツがどのように分散されるかを追跡する。マルチメディア・データではなくコマンドと状況情報のみが伝送されることになり、その記憶域はエンド・ノード間で分散されるため、サーバ１とスイッチ２との間のネットワーク接続が必要とする帯域幅が少なくなる。当分野の技術者であれば理解されるように、各エンド・ノード側の記憶ユニットはハード・ディスク・ドライブ、またはそのマルチメディア・コンテンツの記憶、伝送、および再生が可能な任意の種類の記憶デバイスであってよい。技術的な成熟段階に達したため記憶デバイスの価格は急速に下がっており、この形

態の分散型記憶はさらに魅力的かつ費用効果の高いものとなってきている。

【００３５】

図４Ｃで例示されたシステムでは、エンド・ノード５はマルチメディア・コンテンツＡを、エンド・ノード８はマルチメディアＢを、エンド・ノード９はマルチメディア・コンテンツＣを、さらにエンド・ノード１１はマルチメディアＤを要求しており、エンド・ノード６の記憶ユニットにはマルチメディア・コンテンツＡが、エンド・ノード９の記憶ユニットにはマルチメディア・コンテンツＢが、エンド・ノード１０の記憶ユニットにはマルチメディア・コンテンツＣおよびＤが、ならびにエンド・ノード１２の記憶ユニットにはマルチメディア・コンテンツＢが含まれている。

【００３６】

図４Ｃに示されるように、分散型記憶システムは、コンテンツ・データベース１３またはコンテンツが利用可能な箇所から伝送される様々なコンテンツ、たとえば映画を、マルチメディア・サーバ１がエンド・ノードに向けて送ることによって初期設定することができる。この分散は、一定のコンテンツの予測される評判、およびエンド・ノードが同じスイッチング・ネットワーク内にあるかどうかに基づいて実行することができる。たとえば、たとえば同じ地域にあり同じ直近のスイッチング・ネットワークを共用しているエンド・ノードが２００ある場合、新作の映画を確実に配信するためには、たとえば１０のエンド・ノードに常駐していればよい。配信は、過度の遅延がなければ、他のそれほど直近でないスイッチング・ネットワーク側にあるエンド・ノードからも行うことが可能である。その他の１９０のエンド・ノードには他のコンテンツを、フラグメント、全体、またはそれらの組み合わせとして配置することができる。需要が変化した場合、ロケーションおよび分散は、統計的分析のための一般的なツールを使用して追跡可能な使用量を反映するように変更することができるため、これは初期段階にすぎない。

【００３７】

さらに、初期またはそれ以降のロケーション管理は顧客の介入を必要としないため、オフピーク時に実行することができる。したがって、ほとんどの消費者が

眠っている午前３時に、消費者のエンド・ノード側にある記憶ユニットは、好ましくは中央サーバから静かに命令を受信し、コンテンツを伝送し、あるいは中央サーバを更新することができる。新しいコンテンツがリリースされると、その新しいコンテンツはそれほど新しくないコンテンツを徐々にまたはすべて一度に、削除または置換することになる。したがって分散型記憶システムは動的であり、目まぐるしく変化する消費者のニーズを適切にサポートし続けることができる。

【００３８】

コンテンツの記憶が分散されているため、エンド・ノード６はエンド・ノード５のサーバとして動作することができる。２つのノード間のネットワーク接続が共用媒体である場合、エンド・ノード６はコンテンツＡのデータをエンド・ノード５に直接伝送することが可能であり、そうでなければコンテンツＡをスイッチ３に送信し、次いでこれが従来のインターネットまたは任意のデータ通信のネットワーキングやアドレス指定技法を使用してノード５に送信することによって、コンテンツＡをエンド・ノード５に伝送することができる。マルチメディア・サーバ１は、エンド・ノード５から要求を受け取り、要求されたコンテンツの使用可能性をチェックし、最も適切な伝送方法、たとえばエンド・ノード６から伝送することなどを決定し、エンド・ノード６にコンテンツＡをエンド・ノード５に伝送するように命令するように、「トラフィック制御装置」として動作できる。

【００３９】

さらに図４Ｃを参照すると、エンド・ノード６がエンド・ノード５からのコンテンツＡの要求に応じているとき、エンド・ノード６側の視聴者が、同様に、こうしたコンテンツを再生することを要求する可能性がある。こうした状況では、データは記憶ユニット、たとえばハード・ドライブから、ＰＣまたはＳＴＢのいずれであってもプロセッサのメモリに読み出される。次いで、データはプロセッサのメモリからケーブルまたはＤＳＬネットワークへ伝送される。ローカルで視聴するために同時に非常に近隣で同じデータが必要な場合、そのデータは依然としてメモリ内にキャッシュされている可能性が高いので、ローカル・ディスプレイに送信することができる。メモリ内にキャッシュされていない場合、データは記憶ユニット、たとえばハード・ドライブから再度読み出すことができる。当分

野の技術者であれば理解されるように、高速プロセッサおよび通信機能を備えた現在のＰＣシステムならびにＳＴＢは、２セットの読取り要求を同時に処理することが容易である。

【００４０】

マルチメディア・サーバを集中型トラフィック制御装置として動作させる代わりに、それぞれのエンド・ノードにその要求を他のエンド・ノードにブロードキャストさせる方法がある。要求されたコンテンツを備えたエンド・ノードは、伝送状況を監視して、要求されたコンテンツにとって最もよいソースであるかどうかを判定する。最もよいソースであれば、要求に回答し、要求されたコンテンツを要求者に伝送する。要求に対する回答が複数ある場合、要求側エンド・ノードは受信の優先順位を決定し、伝送の優先順位をソース側エンド・ノードに通知する。伝送が混乱した場合、要求側ノードは優先順位に従って、次のソース側エンド・ノードに移ることができる。第２のソース側エンド・ノードは、第１のソース側エンド・ノードが終わった地点から伝送を開始することができる。

【００４１】

同様に、エンド・ノード９は、コンテンツＢを提供することでエンド・ノード８のサーバとして動作することが可能であると同時に、エンド・ノード１０からコンテンツＣを受け取ることができる。エンド・ノード１０はコンテンツＣおよびＤを記憶し、コンテンツＣをエンド・ノード９に送信すると同時にコンテンツＤをエンド・ノード１１に送信することによって、サーバとして動作することが可能である。

【００４２】

エンド・ノードは、それ自体だけでサーバとなる必要はない。他のエンド・ノードと順にまたは同時に動作して、配信を完了することができる。エンド・ノード８は、エンド・ノード９およびエンド・ノード１２の両方からコンテンツＢを受け取ることができる。これは、特にアップロード（エンド・ノードからスイッチへの方向）速度の方がダウンロード（スイッチからエンド・ノードへの方向）速度よりも遅い場合に、コンテンツＢの伝送時間を減らすために望ましい。これは、ケーブル・モデムおよびＡＤＳＬ（非対称デジタル加入者回線）ネットワー

ク技術に多く見られる。また、コンテンツ全体がエンド・ノードにダウンロードされる前に、コンテンツの再生が開始するような場合にも有用である。たとえば、エンド・ノード９からエンド・ノード８へのダウンロードの初期部分の速度に基づいて、コンテンツの終わりに達する前にエンド・ノード９からのダウンロードだけが完了するであろうと予測された場合、コンテンツＢの再生を開始しておくことができる。ただし、いったん再生が開始すると、スイッチ４からスイッチ３への予期せぬネットワークの輻輳によって、またはエンド・ノード９からスイッチ４へのアップロード速度の予期せぬ低下によって、ダウンロード速度が低下した場合、コンテンツＢの未視聴部分をエンド・ノード１２からエンド・ノード８に伝送することもできる。

【００４３】

例を挙げると、エンド・ノード８がエンド・ノード９からコンテンツＢの最初の２５％を受信したと想定する。このコンテンツの最初の２５％のダウンロード速度ならびにコンテンツの再生速度に基づいて、エンド・ノード８は再生を開始する。この例では、再生速度はダウンロード速度に等しい。３０％受信した時点で、ダウンロード速度が２分の１に低下する。ダウンロード速度が上がらない場合、コンテンツＢの再生は映画または音楽の９０％時点で中断されるであろう。その際、たとえば３５％時点で、エンド・ノード１２に、コンテンツＢの最後の２０％の伝送を即時に開始するように命令し、エンド・ノード９にコンテンツの伝送を３５％時点から続行して８０％時点で停止するように命令することができる。この方法は、アップロード伝送速度またはスイッチ間の伝送速度が、ダウンロード伝送速度よりも遅い場合に有用である。

【００４４】

この複数のエンド・ノードからの同時または並行した伝送方法は、再生データ速度およびダウンロード・データ速度がアップロード・データ速度よりも速い場合に、ネットワークの再生開始回数を減らすためにも使用することができる。たとえば、再生速度が毎秒２メガビットであり、ダウンロード速度が毎秒３メガビットをサポートすることが可能であって、単一のエンド・ノードのアップロード速度が毎秒１メガビットであると想定する。図５Ａに示されたネットワークでは

、エンド・ノード５がコンテンツＡの再生を希望しており、これはいくつかの異なるフラグメントとしてエンド・ノード６から５に記憶されている。異なるノードでのフラグメントのロケーションに関する情報は、マルチメディア・サーバ１に記憶しておくことが好ましい。異なるノードのアップロードおよびダウンロード機能もマルチメディア・サーバ１に記憶可能であるか、またはアップロード速度およびダウンロード速度を判定するための即時テストの伝送が可能である。

【００４５】

図５Ａを参照すると、エンド・ノード５はマルチメディア・サーバ１に接触する。サーバは他のエンド・ノードからエンド・ノード５へのフラグメント伝送を調整する。第１段階では、エンド・ノード６、７、および８がそれ自体に記憶されていたフラグメントをエンド・ノード５に伝送し、各伝送側のエンド・ノードからの個々のフラグメントが毎秒１メガビットでしかアップロードできないにもかかわらず、エンド・ノード５は３つのフラグメントを毎秒３メガビットで並行して受け取る。エンド・ノード６からのコンテンツの０～５％を含むフラグメントが再生速度の半分で伝送されるため、エンド・ノード５はフラグメントの最初の半分を受け取るまではコンテンツの再生を開始することができない。それよりも早く再生を開始した場合、フラグメントが完全に受信されるまでにデータが尽きて、再生にギャップが生じてしまう。

【００４６】

エンド・ノードのインターネット・アドレスが定まっておらず、時々変更される場合がある。インターネット・アドレスが変更されたときに制御側のマルチメディア・サーバ１に通知する際に、それぞれのエンド・ノードにあるプログラムを使用することができる。

【００４７】

図５Ｂに示されるように、エンド・ノード６、７、および８からのフラグメントがエンド・ノード５に伝送された場合、マルチメディア・サーバ１は、エンド・ノード９、１０、および１１などの必要なフラグメントを含む他のエンド・ノードから、次の１５～３０％のフラグメントの伝送を調整することができる。エンド・ノード９、１０、および１１がエンド・ノード５にデータを伝送している

間、エンド・ノード６、７、および８は、必要であれば異なるエンド・ノードにデータを伝送するのに使用できるようになる。

【００４８】

図５Ｂには、例示の目的で１つのコンテンツ・データベースおよび１つのマルチメディア・サーバのみしか示されていないが、本発明に従った分散システム全体は、郡、州、または国中に散在する、複数のマルチメディア・サーバを備えた複数のコンテンツ・データベースを実施することが可能であることに留意されたい。１つのエンド・ユニットに向かうコンテンツは、１つまたは複数のコンテンツ・サーバから、ならびに複数の他のエンド・ユニットから発信したものであってよい。この「集合体」効果によって、任意の特定サーバまたはデータベース１つにかかる負荷をオフロードすることが可能であり、エンド・ユニット付近にあるデータベースおよびサーバからのコンテンツ配信を達成するための効率的なスキームを提供することができる。

【００４９】

図５Ｂを参照すると、エンド・ノード５がコンテンツＡの視聴を完了すると、その記憶ユニットにはコンテンツＡのすべてのフラグメントのコピーが存在することになる。コンテンツＡが他のエンド・ノードにも評判であることが予測される、たとえば新作である場合、コンテンツ全体をエンド・ノード５に記憶したままにすることが可能であり、したがって他のエンド・ノードに配信することが可能であるか、または一部だけを保持しておくことも可能である。このエンド・ノードにどの部分を保持しておくかについては、他のエンド・ノードでのコンテンツＡの記憶、または分散状況に基づいて決定される。たとえば、他のエンド・ノードが他のフラグメントを十分に格納することができるため、コンテンツＡの最初の３０％フラグメントだけを必要とする記憶状況が可能である。コンテンツＡが近い将来視聴されることが予測されない場合は、即時に削除されるか、または他のコンテンツをエンド・ノード５の記憶ユニットに記憶する必要が生じたときに第一に削除するコンテンツに指定される。

【００５０】

次に図７を参照すると、サーバの指示に従ってコンテンツをエンド・ノード・

ユニットに分散するプロセスを示す流れ図が記載されている。図７に示されるように、エンド・ユーザユニット（ＥＵＵ１）は、たとえば、ＥＵＵ１が最初にエンド・ユーザの家にインストールされた後に、オンライン上にありアクティブで準備が整っていることを中央サーバに通知する。こうした通知があると、中央サーバはデータ・ブロックＮを記憶させるためにＥＵＵ１に伝送する。ＥＵＵ２が中央サーバからデータ・ブロックＮを要求したときに、中央サーバはＥＵＵ２に、データ・ブロックＮがＥＵＵ１から伝送される予定であることを通知する。したがって中央サーバはＥＵＵ１に対して、要求されたデータ・ブロックをＥＵＵ２に伝送するように命令することができる。この時点で、インターネット送信アドレスはＥＵＵ１であり、インターネット受信アドレスはＥＵＵ２である。要求されたデータ・ブロックを受け取ると、ＥＵＵ２は中央サーバに伝送が完了したことを通知する。

【００５１】

次に図８Ａおよび８Ｂを参照すると、本発明に従ったＶＯＤシステムの他の実施形態が示されている。図５Ａおよび５Ｂで以前に示されたシステムでは、いくつかのエンド・ノードが単一のマルチメディア・サーバ１によって処理されていたことに留意されたい。図８Ａおよび８Ｂは、このシステムの代替または精密にしたものであって、マルチメディア・サーバの機能が別々の部分に分割され、すなわち本質的にオフロードされており、コンテンツはエンド・ノードとマルチメディア・コンテンツ・サーバとの組み合わせから配信されている。ここでは、コンテンツ配信は分散型コンテンツ・サーバならびに他のエンド・ノードによって、あるいはサーバとエンド・ノードの組合せによって達成される。

【００５２】

図８Ａおよび８Ｂに示されたシステムでは、エンド・ノードＣおよびＤはパーソナル・コンピュータ（ＰＣ）または通常家庭内にある他の機器であってよい。制御サーバＡは、制御および調整の役割を果たすインターネット・サーバ・コンピュータであってよい。このインターネット・サーバ・コンピュータの例がＭｉｃｒｏｓｏｆｔ　ＮＴオペレーティング・システムを使用するＣｏｍｐａｑ　Ｐｒｏｌｉａｎｔサーバまたはこれと同等のものである。ＷｅｂサーバＢは、イン

ターネット・サーバ・コンピュータであってよく、その例が、Ｓｕｎ　Ｓｏｌａｒｉｓオペレーティング・システムを使用するＳｕｎ　ＭｉｃｒｏｓｙｓｔｅｍのＥｎｔｅｒｐｒｉｓｅサーバまたはこれと同等のものであり、Ｗｅｂページをエンド・ノードに配信するが、マルチメディア・コンテンツは保持している場合もしていない場合もある。マルチメディア・コンテンツ・サーバＥおよびＦは、マルチメディア・コンテンツを保持しているインターネット・サーバ・コンピュータであってよい。この例では機能が分割されているが、当分野の技術者であれば理解できるように、インターネット・サーバ・コンピュータの場合、制御、Ｗｅｂ処理、およびマルチメディア・コンテンツ処理機能を実行し、任意の組合せでこれを組み合わせることが可能である。

【００５３】

図８Ａおよび８Ｂは、マルチメディア・データを、マルチメディア・コンテンツ・サーバとエンド・ノードとの組合せからエンド・ノードへ配信する、本発明に従ったＶＯＤシステムの他の実施形態を示す図である。したがって、この実施形態により、マルチメディア・データを、マルチメディア・コンテンツ・サーバのみからエンド・ノードまたは複数のエンド・ノードに配信するシステムを構築させることが可能である。

【００５４】

本明細書で前述したように、映画ファイルなどのマルチメディア・コンテンツを第１に小さなファイルにフラグメント化し、この小さなファイルを記憶するためにエンド・ノードおよび／または他のサーバに分散することができる。この例では、コンテンツ・フラグメントはエンド・ノードＣ（ステップ３）、エンド・ノードＤ（ステップ４）、マルチメディア・コンテンツ・サーバＥ（ステップ３）、およびマルチメディア・コンテンツ・サーバＦ（ステップ３）に分散されている。さらに本発明では、ファイル・フラグメントのコピーを追加のエンド・ノードまたはサーバに分散させることが可能であり、その結果、各ファイル・フラグメントが複数のエンド・ノードまたはサーバ上に常駐することができる。この冗長性により、エンド・ノードまたはサーバを他のものと置き換えることが可能であり、エンド・ノードまたはサーバのデータ伝送が遅くなった場合に有用であ

る。データは、これらのエンド・ノードおよびサーバ上に常住することが可能であり、必要に応じて伝送することも可能である。

【００５５】

また、前述のように、視聴側エンド・ノードは、元のファイル順序でファイル・フラグメントを再統合することができる一部のソフトウェアを含むことが可能である。最終的に、映画のファイル・フラグメントを保持するエンド・ノードまたはインターネット・サーバが、制御サーバからコマンド受け入れ、ファイル・フラグメントをエンド・ノードまたはインターネット・サーバに配信するのを可能にする、何らかのソフトウェアを含むことができる。

【００５６】

図８Ａでは、エンド・ノードＤ側のユーザが、たとえば映画の視聴を希望したときにステップ１が発生する。ノードは映画のデータに関する要求をＷｅｂサーバＢに送信する。ステップ２では、ＷｅｂサーバＢが要求を制御サーバＡに渡す。次いで制御サーバＡが、どのエンド・ノードまたはインターネット・サーバに所望の映画のファイル・フラグメントが含まれているかを判定する。ステップ３では、制御サーバＡがエンド・ノードＣ、マルチメディア・コンテンツ・サーバＥ、およびマルチメディア・コンテンツ・サーバＦに対して、所望の映画のファイル・フラグメントをエンド・ノードＤに配信するように命令を送る。図８Ｂに示されたステップ４では、エンド・ノードＣ、マルチメディア・コンテンツ・サーバＥ、およびマルチメディア・コンテンツ・サーバＦが共に、映画のファイル・セグメントをエンド・ノードＤに配信する。様々なフラグメントの再統合または再アセンブリは、各フラグメントが同じタイトルから他のフラグメントに関する固有の識別を提供するように符号化されている場合、視聴側エンド・ノードによって実行可能であることに留意されたい。こうした再統合または再アセンブリによって、視聴側エンド・ノードに、視聴側エンド・ノードの初期の要求に応答して、サーバから配信されるフラグメントの「スクリプト」を取得させることもできる。この「スクリプト」は、自転車の組み立て方法に関する指示書とよく似ており、フラグメントの再統合および再アセンブリを容易にするものである。

【００５７】

映画のタイトルまたはデータ・ファイルがいったんフラグメント化されると、各フラグメントには、映画の全編におけるその位置を識別する固有のコードが備えられるということを指摘しておく。映画またはデータ・ファイルを位置符号化する標準的な方法は、インターネット・ファイルがパケット化され、インターネット全体にわたって別々に配信されて、受信の最終地点で再アセンブルされるという方法と同様に確立されることが好ましい。

【００５８】

図には示されていないが、当分野の技術者であれば、ＷｅｂサーバＢがマルチメディア・コンテンツ・サーバとしても動作可能であることが明らかであろう。

【００５９】

ＥＵＵが記憶するデータの各フラグメントは、セキュリティの目的で異なる暗号キーを用いて暗号化できることに留意されたい。たとえば、ＥＵＵが５つのプログラムから５つのフラグメントを、すなわち１プログラムから１フラグメントを記憶する場合、各フラグメントは専用の暗号キーを持つことができる。フラグメントまたはプログラムを暗号化することによって、ユーザがＥＵＵに無許可でアクセスできないようにする。当分野の技術者であれば理解されるように、各ＥＵＵでの記憶は、ＥＵＵが様々なコンテンツを省略なしで格納しているか、またはフラグメントの集まりを格納しているかどうかが、ユーザに対してトランスペアレントであることが好ましい。

【００６０】

上記の開示内容に従って、本発明は、待機時間を最小とし、単一のエンド・ノードからのコンテンツのアップロード伝送速度が、再生側エンド・ノードの再生およびダウンロード速度よりも遅い場合であっても、コンテンツをフラグメント化することおよび多数のネットワーク化された記憶ノード間でコンテンツを分散することによって、コンテンツの連続的な再生を提供する。さらに本発明は、複数のエンド・ノードが同じコンテンツを視聴し、各視聴間の遅延がわずかであることも可能にし、この遅延がフラグメントの持続時間によって設定される。本発明は、２つのデータ伝送方法で使用することができる。たとえば、ネットワークは図６に示されたＤＳＬ（デジタル加入者回線）技術を使用するか、あるいは図

１に示されたケーブルＴＶ技術と共に使用することができる。

【００６１】

以上、データ配信に関する本発明の大部分を、ビデオ・オン・デマンド・システムの実施に関して述べてきたが、当分野の技術者であれば、本発明が「データ・オン・デマンド」システムも実施可能であることを理解されよう。こうしたシステムでは、各エンド・ユーザ・サイトの記憶ユニットが、他のユーザまたはそれ自体がアクセスするためにデータを記憶することになる。記憶されるデータは、異なる種類のデータの部分、すなわちフラグメントであってもよく、たとえば中央サーバを介してデータの記憶、伝送、およびアセンブリを制御、追跡、および管理するためのメカニズムがあれば、これをいずれかの場所に記憶された他の部分とアセンブルして、完全な形にすることが可能である。こうしたネットワークを管理する者は、記憶したデータに招かれざるエンド・ユーザがアクセスするのを防ぐために、データのセキュリティおよび暗号手段を実施する義務を負う場合がある。

【００６２】

本発明は、当分野の技術者であれば明らかなように、従来の汎用デジタル・コンピュータを使用して実施することができ、かつ本発明の教示に従ってプログラムできる。ソフトウェア分野の技術者であれば明らかなように、熟練したプログラマであれば、本開示の教示に基づいて適切なソフトウェア符号化を容易に実行することができる。

【００６３】

本発明は、当分野の技術者であれば容易に理解できるように、適用分野特有の集積回路を作成することによって、または従来の構成要素回路の適切なネットワークを相互接続することによっても実施可能である。

【００６４】

本発明には、分散型プログラムの記憶または分散ネットワークのコンテンツ・フロー制御など、本発明のプロセスを実行するようにコンピュータをプログラムするのに使用可能な命令を含む記憶媒体である、コンピュータ・プログラム製品も含まれる。記憶媒体は、無制限に、フロッピィ・ディスク、光ディスク、ＣＤ

－ＲＯＭ、および光磁気ディスクを含む任意のタイプのディスク、ＲＯＭ、ＲＡＭ、ＥＰＲＯＭ、ＥＥＰＲＯＭ、磁気または光カード、あるいは、電子命令を記憶するのに好適な任意のタイプの媒体を含むことができる。本発明を具体化する装置が動作すると、物理現象でありデバイスを適切な方法で制御する信号をデバイスが処理するため、本発明の所望の結果が達成される。

【００６５】

上記の開示に照らせば、本発明の多数の修正および変形が可能であることは明白である。したがって、添付の特許請求の範囲の範囲内であれば、本発明が本明細書に具体的に記載されたものとは異なる他の方法で実施可能であることを理解されよう。

【図面の簡単な説明】

【図１Ａ】

ケーブル・ブロードキャスト・システムを介した従来のビデオ・オン・デマンド・システムを示す図である。

【図１Ｂ】

エンド・ユーザがケーブル・モデムを備えているケーブルＴＶブロードキャスト・システムを介した例示的なビデオ・オン・デマンド・システムを示す図である。

【図２】

Ａは単一のマルチメディア・サーバが１００人のユーザに対して同時にＡＶコンテンツを処理する方法の一例を示す図である。

Ｂはマルチメディア・サーバと顧客との間に３つのキャッシュ・メモリを挿入する方法の一例を示す図である。

【図３】

Ａはユーザ・サイト側のエンド・ノード機器を簡略的に示す構成図である。

Ｂは集中型サーバおよびユーザ・サイト側のエンド・ノード機器を備えた従来のＶＯＤシステムを簡略的に示す構成図である。

【図４】

Ａは本発明に従い、ＴＶで使用するためのケーブル・モデムを備えたエンド・

ノード機器を簡略的に示す構成図である。

Ｂは本発明に従い、ＰＣで使用するためのケーブルまたはＤＳＬモデムを備えたエンド・ノード機器を簡略的に示す構成図である。

ちゃ本発明の分散型サーバ・システムを簡略的に示す構成図である。

【図５Ａ】

再生開始回数を減らすために、複数のエンド・ノードからのコンテンツの同時伝送を示す図である。

【図５Ｂ】

再生開始回数を減らすために、複数のエンド・ノードからのコンテンツの同時伝送を示す図である。

【図６】

ＤＳＬネットワークに基づいたＶＯＤシステムを簡略的に示す構成図である。

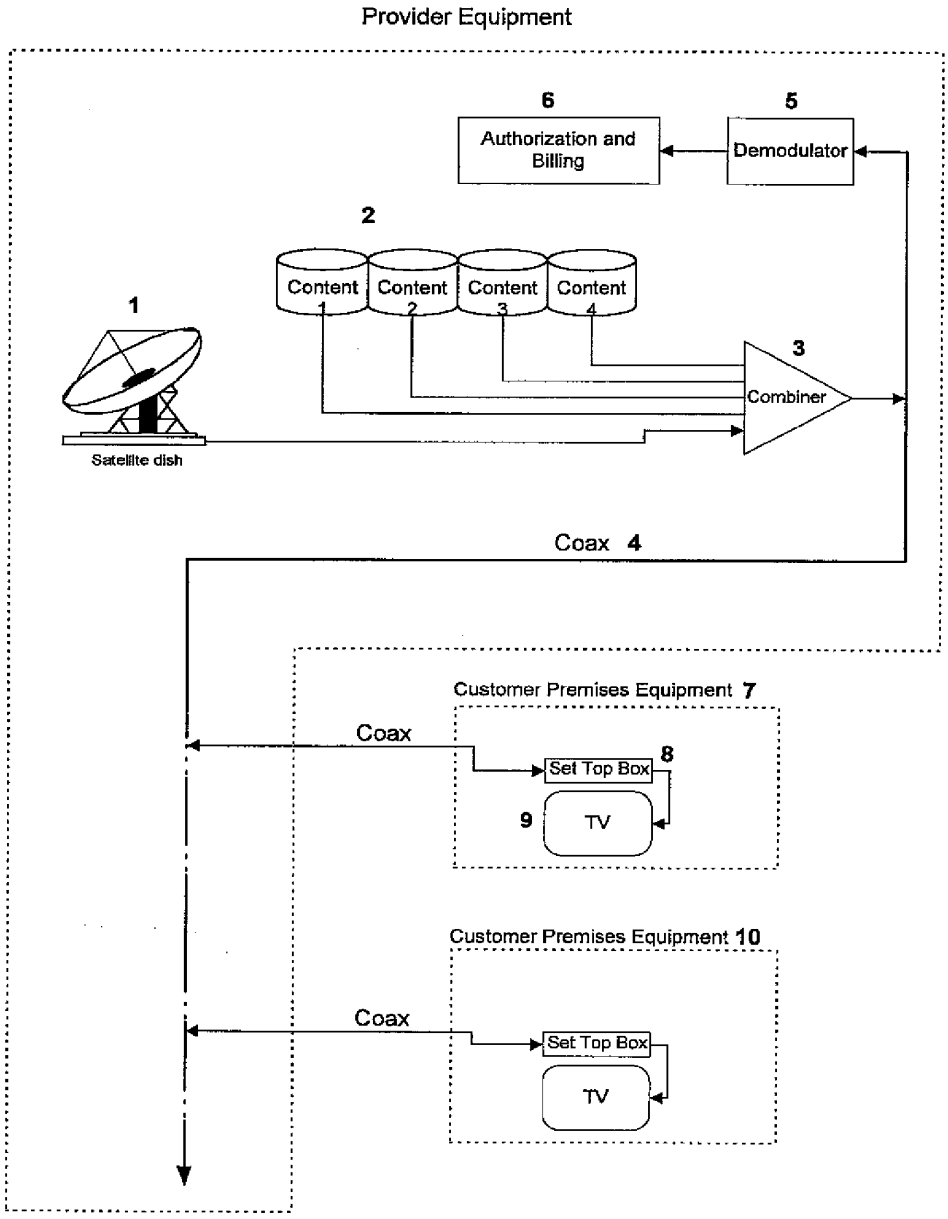
【図７】

エンド・ノード・ユニットへのコンテンツの分散プロセスを示す流れ図である。

【図８】

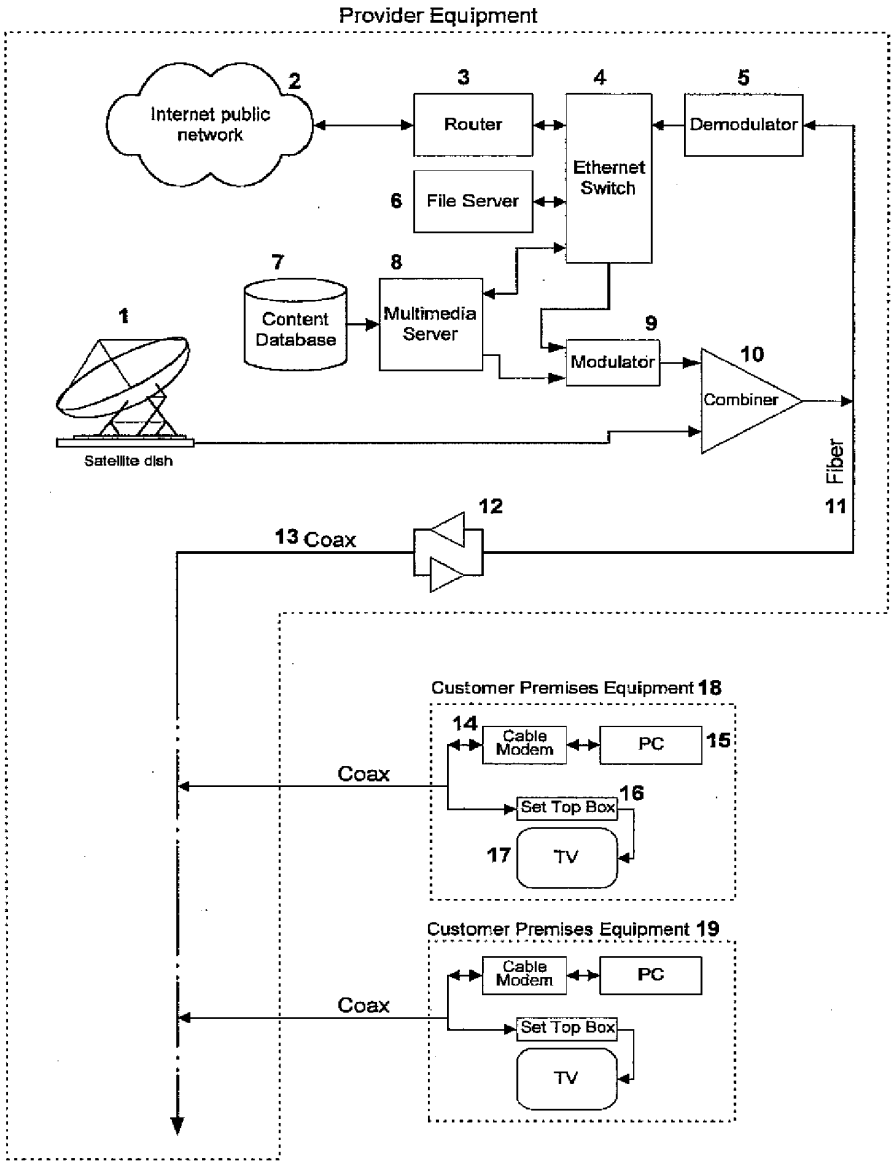
エンド・ノードとコンテンツ・サーバの組み合わせから配信されるコンテンツを備えたＶＯＤシステムの、他の実施形態を示す図である。

【図１Ａ】



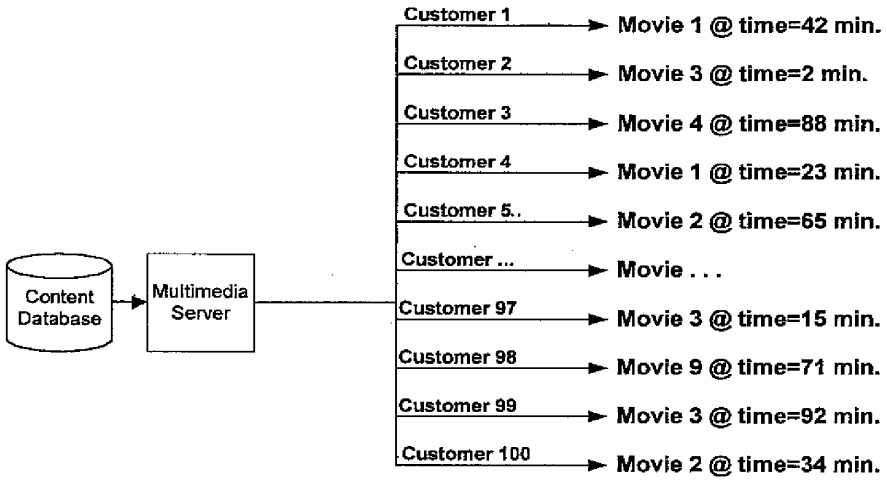

| | | | |
|---|---|---|---|
| 1 | 衛星放送用パラボラ・アンテナ | 6 | 許可および課金 |
| 2 | コンテンツ | 7 | 顧客構内設置機器 |
| 3 | 結合器 | 8 | セットトップ・ボックス |
| 4 | 同軸ケーブル | １０ | 顧客構内設置機器 |
| 5 | 復調器 | Provider Equipment | プロバイダ機器 |

【図１Ｂ】



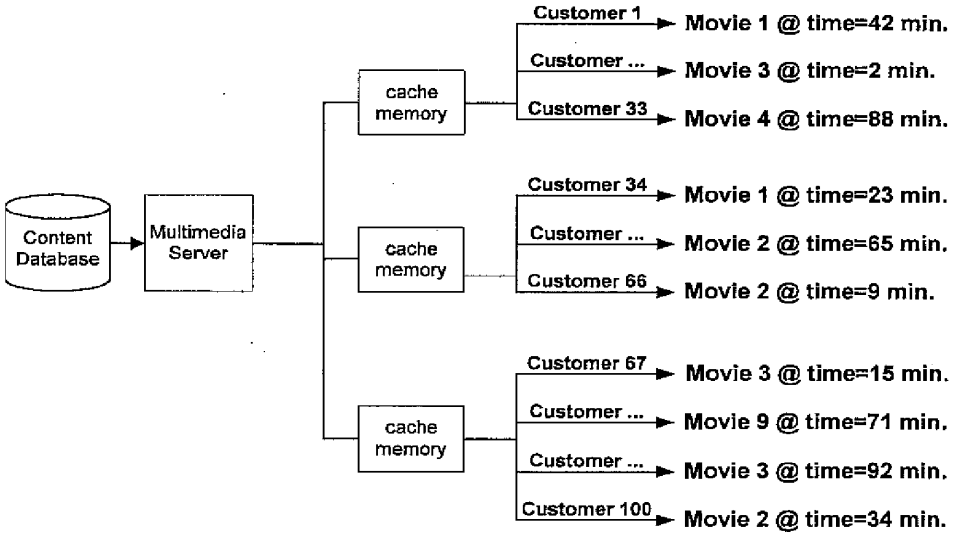

| | | | |
|---|---|---|---|
| 1 | 衛星放送用パラボラ・アンテナ | 9 | 変調器 |
| 2 | インターネット公衆ネットワーク | １０ | 結合器 |
| 3 | ルータ | １１ | 光ファイバ |
| 4 | イーサネット・スイッチ | １３ | 同軸ケーブル |
| 5 | 復調器 | １４ | ケーブル・モデム |
| 6 | ファイル・サーバ | １６ | セットトップ・ボックス |
| 7 | コンテンツ・データベース | 18,19 | 顧客構内設置機器 |
| 8 | マルチメディア・サーバ | Provider Equipment | プロバイダ機器 |

【図２】



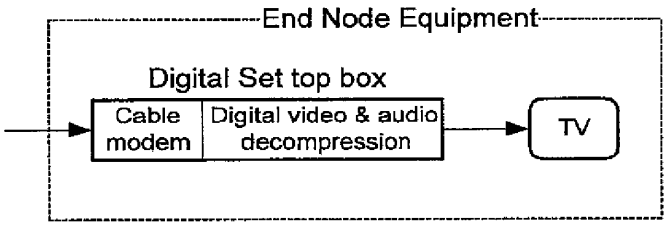

A

| | |
|---|---|
| Content Database | コンテンツ・データベース |
| Multinedia Server | マルチメディア・サーバ |
| Customer | 顧客 |
| cache memory | キャッシュ・メモリ |
| Movie | 顧客 |
| time | 時間 |
| min. | 分 |



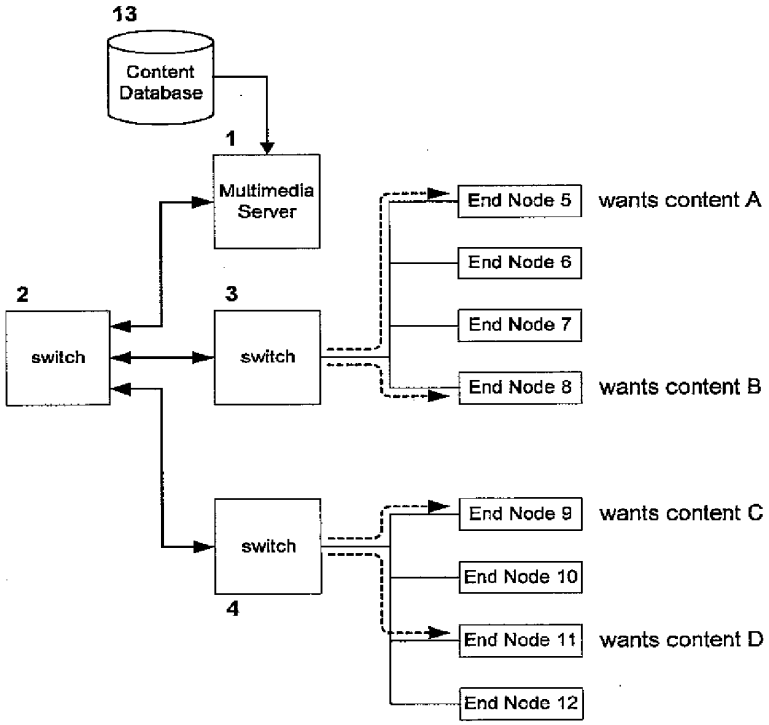

B

【図３】




**A - Conventional End Node Equipment**

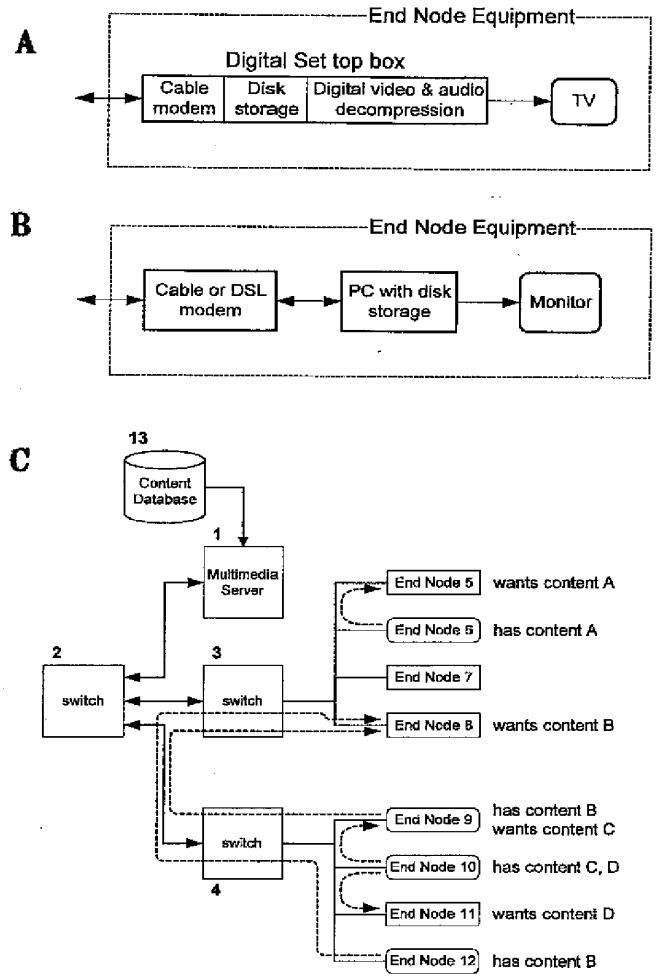
End Node Equipment　エンド・ノード機器
Digital Set top box　デジタル・セットトップ・ボックス
Cable modem　ケーブル・モデム
Digital video & audio decompression　デジタル・ビデオ＆オーディオ圧縮解除
Conventioal End Node Equipment　従来のエンド・ノード機器




**B**

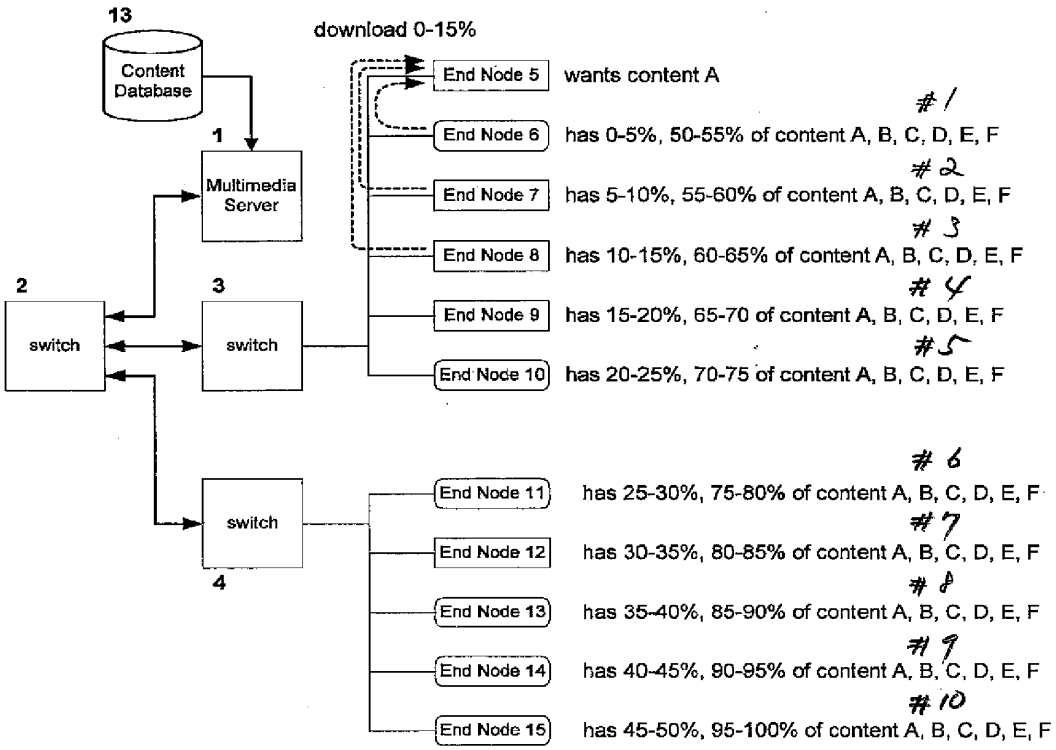
1　マルチメディア・サーバ
２～４　スイッチ
１３　コンテンツ・データベース
End Node　エンド・ノード
Wants content　コンテンツを希望

【図４】



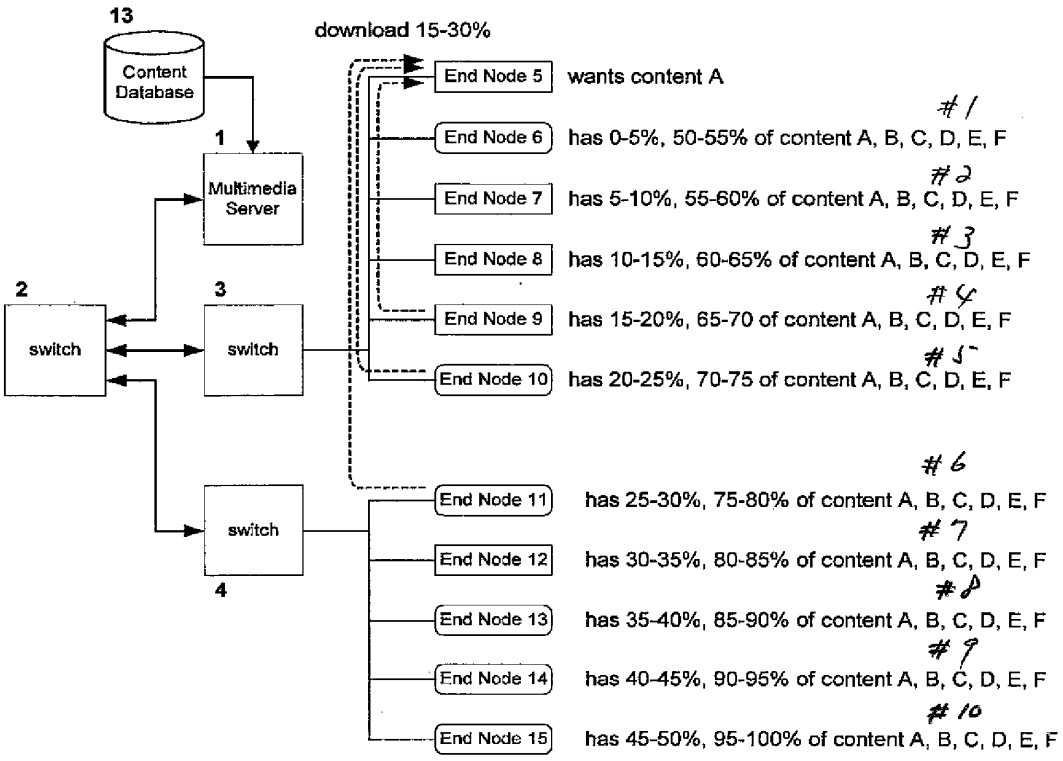

End Node Equipment　エンド・ノード機器
Digital Set top box　デジタル・セットトップ・ボックス
Cable modem　ケーブル・モデム
Digital video & audio decompression　デジタル・ビデオ＆オーディオ圧縮解除
Conventional End Node Equipment　従来のエンド・ノード機器
Cable or DSL modem　ケーブルまたはＤＳＬモデム
PC with disk storage　ディスク記憶装置を備えたＰＣ
Monitor　モニタ
１　マルチメディア・サーバ
２～４　スイッチ
１３　コンテンツ・データベース
End Node　エンド・ノード
Wants content　コンテンツを希望
has content　コンテンツを所有

【図５Ａ】



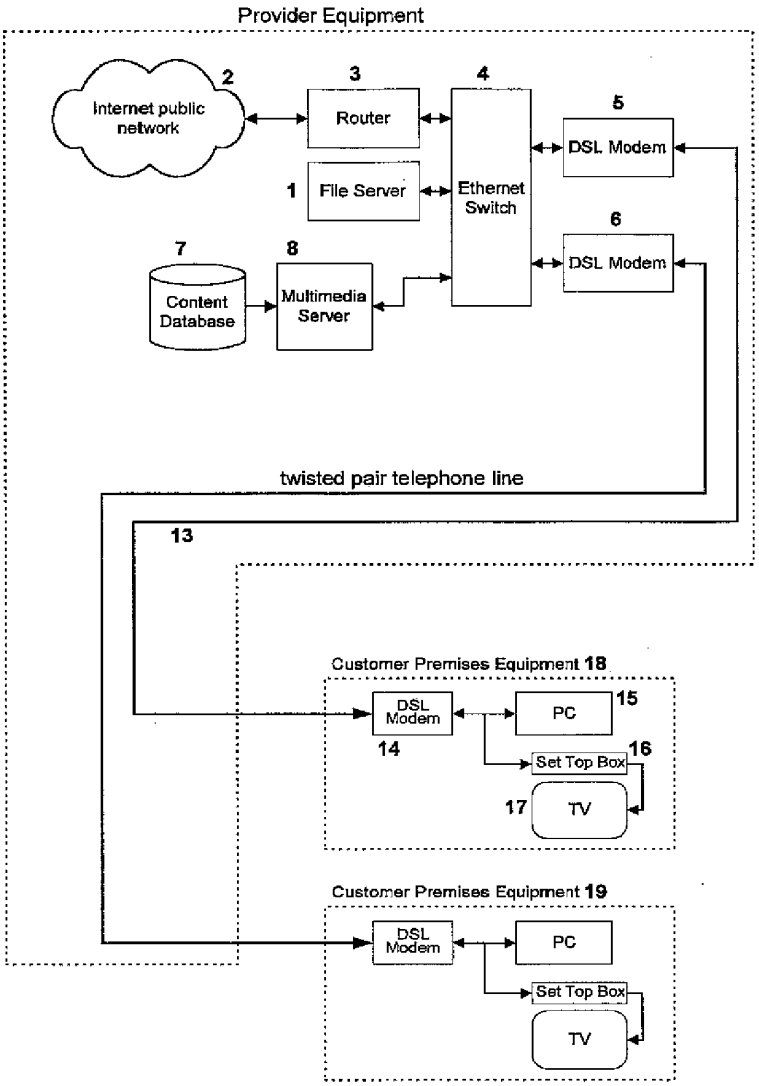

１　　マルチメディア・サーバ
２～４　　スイッチ
１３　　コンテンツ・データベース
End Node　エンド・ノード
Wants content　　コンテンツを希望
download 0-15%　　０～１５％をダウンロード
#1　　コンテンツＡ、Ｂ、Ｃ、Ｄ、Ｅ、Ｆの０～５％、５０～５５％を所有
#2　　コンテンツＡ、Ｂ、Ｃ、Ｄ、Ｅ、Ｆの５～１０％、５５～６０％を所有
#3　　コンテンツＡ、Ｂ、Ｃ、Ｄ、Ｅ、Ｆの１０～１５％、６０～６５％を所有
#4　　コンテンツＡ、Ｂ、Ｃ、Ｄ、Ｅ、Ｆの１５～２０％、６５～７０％を所有
#5　　コンテンツＡ、Ｂ、Ｃ、Ｄ、Ｅ、Ｆの２０～２５％、７０～７５％を所有
#6　　コンテンツＡ、Ｂ、Ｃ、Ｄ、Ｅ、Ｆの２５～３０％、７５～８０％を所有
#7　　コンテンツＡ、Ｂ、Ｃ、Ｄ、Ｅ、Ｆの３０～３５％、８０～８５％を所有
#8　　コンテンツＡ、Ｂ、Ｃ、Ｄ、Ｅ、Ｆの３５～４０％、８５～９０％を所有
#9　　コンテンツＡ、Ｂ、Ｃ、Ｄ、Ｅ、Ｆの４０～４５％、９０～９５％を所有
#10　　コンテンツＡ、Ｂ、Ｃ、Ｄ、Ｅ、Ｆの４５～５０％、９０～１００％を所有

【図５Ｂ】



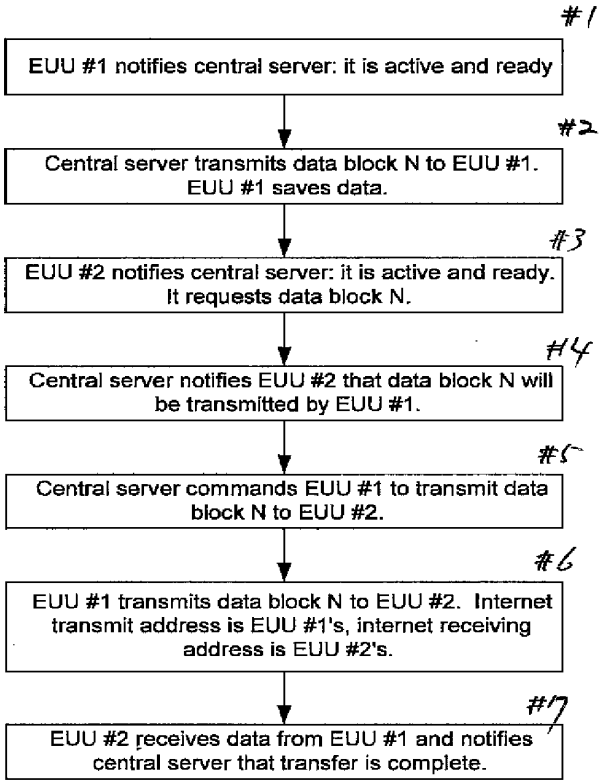

１　　マルチメディア・サーバ
２～４　　スイッチ
１３　　コンテンツ・データベース
End Node　エンド・ノード
Wants content　　コンテンツを希望
download 0-15%　　０～１５％をダウンロード
＃１　　コンテンツＡ、Ｂ、Ｃ、Ｄ、Ｅ、Ｆの０～５％、５０～５５％を所有
＃２　　コンテンツＡ、Ｂ、Ｃ、Ｄ、Ｅ、Ｆの５～１０％、５５～６０％を所有
＃３　　コンテンツＡ、Ｂ、Ｃ、Ｄ、Ｅ、Ｆの１０～１５％、６０～６５％を所有
＃４　　コンテンツＡ、Ｂ、Ｃ、Ｄ、Ｅ、Ｆの１５～２０％、６５～７０％を所有
＃５　　コンテンツＡ、Ｂ、Ｃ、Ｄ、Ｅ、Ｆの２０～２５％、７０～７５％を所有
＃６　　コンテンツＡ、Ｂ、Ｃ、Ｄ、Ｅ、Ｆの２５～３０％、７５～８０％を所有
＃７　　コンテンツＡ、Ｂ、Ｃ、Ｄ、Ｅ、Ｆの３０～３５％、８０～８５％を所有
＃８　　コンテンツＡ、Ｂ、Ｃ、Ｄ、Ｅ、Ｆの３５～４０％、８５～９０％を所有
＃９　　コンテンツＡ、Ｂ、Ｃ、Ｄ、Ｅ、Ｆの４０～４５％、９０～９５％を所有
＃１０　コンテンツＡ、Ｂ、Ｃ、Ｄ、Ｅ、Ｆの４５～５０％、９０～１００％を所有

【図６】



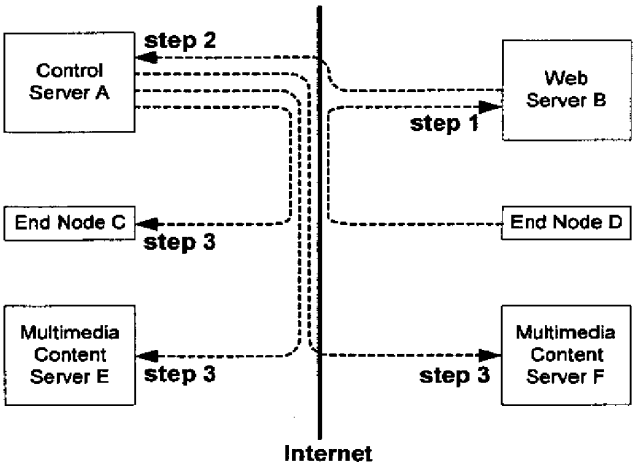

| | | | |
|---|---|---|---|
| 1 | ファイル・サーバ | １６ | セットトップ・ボックス |
| 2 | インターネット公衆ネットワーク | １８ | 顧客構内設置機器 |
| 3 | ルータ | Provider Equipment | プロバイダ機器 |
| 4 | イーサネット・スイッチ | twisted pair telephone lin | ツイスト・ペア電話回線 |
| 7 | コンテンツ・データベース | modem | モデム |
| 8 | マルチメディア・サーバ | Set Top Box | セットトップ・ボックス |

【図７】



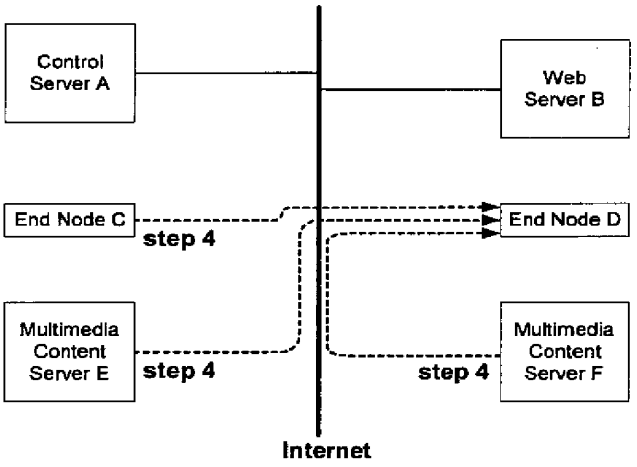

＃１　第１のＥＵＵが、アクティブで準備が整っていることを中央サーバに通知
＃２　中央サーバがデータ・ブロックＮを第１のＥＵＵに伝送し、第１のＥＵＵがデータを保存
＃３　第２のＥＵＵが、アクティブで準備が整っていることを中央サーバに通知。データ・ブロックＮを要求
＃４　中央サーバが、データ・ブロックＮが第１のＥＵＵによって伝送されることを第２のＥＵＵに通知
＃５　中央サーバが、第１のＥＵＵにデータ・ブロックＮを第２のＥＵＵに伝送するように命令
＃６　第１のＥＵＵがデータ・ブロックＮを第２のＥＵＵに伝送。インターネット送信アドレスが第１のＥＵＵ、インターネット受信アドレスが第２のＥＵＵ
＃７　第２のＥＵＵが第１のＥＵＵからデータを受信し、中央サーバに伝送が完了したことを通知

【図８】




A

Control Server　制御サーバ
End Node　エンド・ノード
step　ステップ
Server　サーバ
Internet　インターネット
Multimedia Content Server　マルチメディア・コンテンツ・サーバ




B

【国際調査報告】

**INTERNATIONAL SEARCH REPORT**

International application No.
PCT/US00/21127

A. CLASSIFICATION OF SUBJECT MATTER
IPC(7) :H04N 7/173
US CL :709/219
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. : 709/219; 345/327; 348/7,12,13; 455/4.2, 5.1; H04N 7/173, 7/16

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. |
|---|---|---|
| A | US 5,815,194 A (UEDA) 29 September 1998<br>whole document | 1-22 |
| A | US 5,873,022 A (HUIZER et al.) 16 February 1999<br>whole document | 1-22 |
| A | US 5,884,141 A (INOUE et al.) 16 March 1999<br>whole document | 1-22 |

☐ 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 |
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| "L" | document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified) | "&" | 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<br>10 NOVEMBER 2000 | Date of mailing of the international search report<br>08 JAN 2001 |
| Name and mailing address of the ISA/US<br>Commissioner of Patents and Trademarks<br>Box PCT<br>Washington, D.C. 20231<br>Facsimile No. (703) 305-3230 | Authorized officer<br>CHRISTOPHER GRANT<br>Telephone No. (703) 305-4755 |

Form PCT/ISA/210 (second sheet) (July 1998)*

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|---|---|---|---|---|
| H04N 7/16 | | H04N 7/173 | 610A | |
| 7/173 | 610 | 5/91 | L | |

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(71) Applicant and
(72) Inventor: CHUNG, Randall, M. [US/US]; EdgeStream Inc., 22921 Triton Way, Suite 231, Laguna Hills, CA 92653 (US).

(74) Agent: YU, Philip, K.; Registered Patent Attorney, 100 E. Huntington Drive, Suite 100, Alhambra, CA 91801-1022 (US).

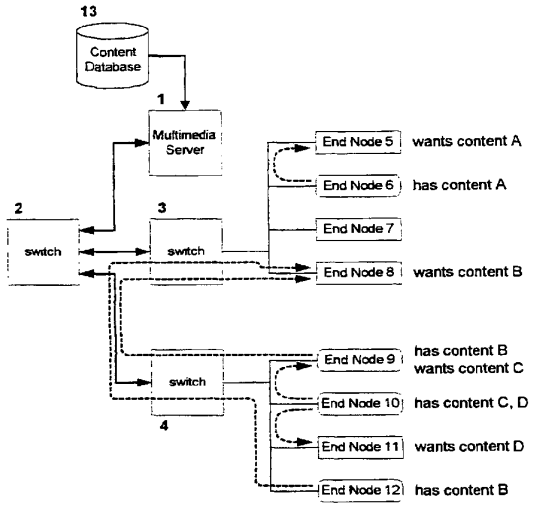
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(84) Designated States *(regional)*: ARIPO patent (GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GW, ML, MR, NE, SN, TD, TG).

**Published:**
— *With international search report.*
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(54) Title: VOD FROM A SERVER OR A USER TO ANOTHER USER




(57) Abstract: A system and method for delivering data to multiple end users (5-12) using distributed storage system connected through a data communications network. The end user equipment for audio or video playback or recording contains a storage unit, such as a magnetic disk. Each storage unit can store data, such as digital video content, i.e. movies, or digital audio content, i.e. songs. The storage unit can also be configured to store portions, or fragments, of digital video or audio content, where the storage location, playback, and recording of digital video or audio content of each storage unit is administered, managed and controlled by a central facility (1). The content for playback of a video or audio content, or portions thereof, may reside on one or more physically separate storage unit, or may also reside on a central storage unit (13).

WO 01/10125 A1

# VOD FROM A SERVER OR A USER TO ANTOHER USER

## Cross Reference to Related Application

This application claims priority from provisional application Serial No. 60/146,893, "Method and Apparatus for Data Delivery Using Distributed Storage System," filed August 2, 1999.

## Field of the Invention

The present invention relates to data communications networks and more specifically to a method and apparatus for delivering data using distributed storage units through a network, such as the Internet.

## Art Background

Ever since the advent of VCR's, there has been a public desire to have a movie-on-demand system to alleviate the need for the viewers to go to the video store. A "video on demand" ("VOD") system provides viewers the ability to select an arbitrary movie or video program and then view the video content at a requested time, whether immediately, a few hours later or even a few days later. The delivery of the video is purely electronic, so that physical media like video tapes or video discs need not be purchased, nor rented at a video store and then returned after viewing.

Cable companies have implemented some form of video delivery system for their cable customers. However, due to limitations in the storage space and bandwidth, the selection of movies is quite limited and the viewers can only watch the movie at the time designated by the cable company. For those who feel like watching an old *Godfather* movie on Wednesday afternoon, they are out of luck. The system offered by the cable company is therefore not a true VOD system, much less a system with any degree of flexibility suitable for a broad range of viewers.

Implementing a practical video on-demand system for a large number of viewers is difficult and expensive. It typically requires a multimedia server which can deliver multiple simultaneous continuous streams of audio or video content to hundreds or thousands of different end customers. Ideally, the customers could choose their content from a library of hundreds of movies or songs. However, a typical hard disk drive may only be able to hold a few full length movies, which means that a multimedia server would have to contain 50 or more disk drives. Figure **1A** illustrates such a conventional cable broadcasting system for "video-on-demand" provisioning.

Another difficulty in implementing a large shared multimedia server is the need to handle and transmit multiple streams of digital multimedia content. A standard definition compressed television signal would be transmitted at an average data rate of about 4 megabits per second. If one multimedia server had to serve one hundred different programs simultaneously, the average total bandwidth required would be 400 megabits per second. This large amount of data would also have to be transmitted to the one hundred viewers without appreciable discontinuity, or the viewing experience would be ruined. A network to support such a high data rate with a guaranteed Quality of Service (QoS) to many users from a central server is thus very expensive, and has been impractical for anyone to build.

With the advent of communication through the Internet using cable modems, it has been suggested that cable modems may enable the provisioning of video on-demand by cable companies. It has been hoped that cable modems coupled with the Internet can achieve what cable companies have failed, that is, a video on-demand system using the Internet.

Figure **1B** illustrates how video on-demand might be provisioned over a cable TV broadcast system with cable modems for a metropolitan area. In this system, analog TV signals are received by a satellite dish 1. The analog TV signals are combined with video on-demand signals and digital communication signals from the Internet through a signal combiner 10.

In Figure **1B**, the video-on-demand signals are digital, although they can also be analog signals. Digital content, such as World Wide Web pages, on the Internet public network 2, are connected to the system through a router 3. The router 3 is used to

translate packet data from one network to another, such as between the Internet network and the example Ethernet network switch 4. The Ethernet network switch 4 directs data to and from the Internet router 3, the fiber return channel demodulator 5, a file server 6, the multimedia server 8, and the modulator 9. The fiber return channel demodulator 5 translates signals returning from the customer premises equipment ("CPE") through the optical fiber 11, back into digital format, where it might then be sent to the Internet. A file server can be used to hold World Wide Web pages or for caching Internet information. The multimedia server controls the content database 7, and can read out multiple movies or songs simultaneously. The content database holds all of the digitized movies or songs. Digital data from the multimedia server or the Ethernet switch going to the end users can go through a digital to analog modulator 9, before being combined with the analog TV signals from the satellite dish 1.

Referring still to Figure **1B**, signals going between the optical fiber 11 and the coax cables 13 can be translated by the coax-to-fiber converter 12. The analog TV signals would be frequency converted through the set top box 16, for transmission to the TV set 17, while the digital signals would be converted to digital by the cable modem 14 for use by the PC 15. The customer premises equipment 18 (CPE) at a single residence may contain one set of equipment, while another residence may contain another set of CPE 19, with each customer viewing different video, audio, or data content.

It is not unusual to have hundreds or thousands of customers served by one set of provider equipment. That means a multimedia server would have to potentially serve different movie or music data streams to each customer simultaneously. This is practically impossible if there are thousands of customers and only one multimedia server. One solution may be to have multiple multimedia servers, with each one serving a subset of the customers; however, this also multiplies the cost of servicing all of the customers. A remaining problem is that a very large amount of multimedia data must travel from a centralized multimedia server, or group of servers. Because each customer may be viewing different videos at different points in time (for instance, at the beginning, middle, or end of the video) from the multimedia server, each video is treated as a separate channel. The bandwidth of hundreds or thousands of separate channels, in addition to the normal broadcast channels is higher than what current transmission pathways can handle today.

Therefore, it is desirable to have an on-demand data delivery system where the multiple recipients can receive the same or different content at any time they choose.

It is also desirable to have such an on-demand data delivery system without exhausting the bandwidth of the server or the transmission infrastructure.

Summary of the Invention

A system and method for delivering data to multiple end users using distributed storage system connected through a data communications network is disclosed, where the end user equipment for audio/video playback or recording contains a storage unit, such as a magnetic disk. Each storage unit can store data, such as digital video content, i.e. movies, or digital audio content, i.e. songs. The storage unit can also be configured to store portions, or fragments, of digital video or audio content, where the storage location, playback, and recording of digital video or audio content of each storage unit is administered, managed and controlled by a central facility. The content for playback of a video or audio content, or portions thereof, may reside on one or more physically separate storage unit, or may also reside on a central storage unit.

The content may also be read out and transmitted concurrently from one or more physically distributed storage units to one or more other physically separate sites for playback, where an entire piece of content, such as a movie, may be separated into equal or unequal sized pieces, and one or more pieces may be stored on multiple physically separate storage units. The assignment of the storage locations of the pieces, the order of transmission, priority of transmission, and destination of the pieces is centrally administered and controlled. The content can also be transmitted simultaneously to storage units other than the one needing it for display, to anticipate the need to deliver the same content to other customers in the near future. This allows for dynamic allocation of resources at any time, peak or off-peak, in anticipation of heavy downloading of certain programs, such as new releases.

Further, the data communications network connecting between the storage units can be either wired or wireless. While the Internet is used with the cable modems, other forms of networking connections can work just as well.

As will be appreciated by those skilled in the art, what is disclosed in the following description is a "set-top box" which is coupled to a disk drive, or a file server, either

locally or remotely, where the "set-top box" acts as a file server for other "set-top boxes." As such, the set-top boxes in the aggregate can serve as a massive and yet distributed storage facility for each of the member set-top boxes. The stored programs or files may also be fragmented into pieces of arbitrary sizes for distributed storage or transmission over multiple set-top boxes. Also, what is disclosed is a personal computer which contains a disk drive which can act as a file server for other computers or set-top boxes, where the files may be fragmented into pieces of any arbitrary sizes for distributed storage or transmission over multiple computers or set-top boxes.

Brief Description of the Drawings

Figure **1A** shows a conventional video-on-demand system over a cable broadcast system.

Figure **1B** shows an exemplary video-on-demand system over a cable TV broadcast system, where uses end-users are equipped with cable modems.

Figure **2A** illustrates an example of how a single multimedia server might serve AV content to a hundred users simultaneously.

Figure **2B** illustrates an example of how three cache memories can be inserted in between the multimedia server and the customers.

Figure **3A** is a simplified block diagram of an End Node Equipment at a user's site.

Figure **3B** depicts a simplified block diagram of a conventional VOD system with a centralized server and end node equipment at user's site.

Figure **4A** is a simplified block diagram of an End Node Equipment with cable modem for use with a TV in accordance with the present invention.

Figure **4B** is a simplified block diagram of an End Node Equipment with cable or DSL modem for use with a PC in accordance with the present invention.

Figure **4C** depicts a simplified block diagram of a distributed server system of the present invention.

Figures **5A, 5B** illustrate simultaneous transfer of content from multiple end nodes to reduce playback starting time.

Figure **6** depicts a simplified block diagram of a VOD system based on DSL network.

Figure **7** is a flow diagram depicting the process of distributing content to end node units.

Figures **8A** and **8B** illustrate another embodiment of the VOD system with the content being delivered from a combination of end nodes and content servers.

Detailed Description of the Preferred Embodiment

A method and apparatus for data delivery using distributed storage system is disclosed. In the description that follows, the present invention is described in terms of servers, switches, routers, databases, end nodes, networks and the Internet, which are the terms typically used by those skilled in the art in communicating among themselves. Also, it should be understood by those skilled in the art that the term "data" can represent audio or video content, multimedia content, or simply binary bits transmitted across a communications network.

As previously mentioned, one possible way of reducing the multimedia server's bandwidth requirements is to have storage units along the main network transmission paths to cache the first transmission of the content. Future requests for the same content from other end users can be serviced from the caching storage unit.

Figure **2A** shows an example of how a single multimedia server might be requested to serve AV content to a hundred users simultaneously. Many customers may be viewing the same AV content, because some content is more popular than others. For instance, a newly released movie may be much more popular than one several years old. However, it is desirable to allow each customer to start viewing the movie at a time of their own choosing, rather than on a fixed schedule, which happens to be the way cable companies offer video programs. This means that although the same movie is being viewed by more than one customer, the data must be sent in duplicate, because the movies may be viewed at different points in time.

Figure **2B** shows how cache memories may be inserted in between the multimedia server and the customers to ease the delivery demand. Each cache memory serves a smaller group of the full set of customers. If AV content has not been previously stored in

a group's cache memory, it will be provided by the central multimedia server. The AV content will be transferred to the customer, and also temporarily stored in the group cache memory. If another customer in the group requests the same AV content, and the AV content still resides in the cache memory, then the cache memory can readily provide the content. This reduces the load on the central multimedia server and reduces the bandwidth used by the server. However, there is an obvious problem to this approach. If the cache memory is too small, then only a small portion of the AV content can be stored, causing many requests for content to bypass the cache. This reduces the effectiveness in reducing the bandwidth and load on the central multimedia server. However, making the cache memory large will increase the cost.

As will be disclosed, the present invention is directed to providing a solution to the problems with the conventional ways of distributing data such as digital multimedia by having a system of storage units at the end nodes, acting as the primary storage of the multimedia content. A centralized multimedia server could still be used to augment the delivery of multimedia content, but the bulk of the requests for multimedia data from the end nodes will be serviced from the individual storage units at the other end nodes.

Such a distributed server system can address the problems inherent in the current centralized server system when used for distributing time-critical multimedia content. As will be described below, Figures **3A** and **3B** illustrate the conventional system utilizing a centralized server, while Figures **4A, 4B** and **4C** illustrate a distributed server system in accordance with the present invention.

Figure **3A** is a simplified block diagram of a conventional End Node Equipment which can be installed at the user's site. It is generally a set-top box ("STB") coupled to the TV. The STB generally has a cable modem and a digital video and audio decompression circuitry. As shown in Figure **3B**, the multimedia server 1 controls the content database 13, which stores all of the multimedia content. The network switch 2 controls the data transfers among the server, network switch 3, and network switch 4. Network switch 3 switches the data from network switch 2 to the user end nodes 5 through 8, while network switch 4 switches the data from network switch 2 to the user end nodes 9 through 12. In this example, end nodes 5, 8, 9, and 11 are receiving multimedia data from the centralized server 1. The server 1 and switch 2 may be separated

by a long distance, possibly requiring expensive high bandwidth connections. The content data streams A and B for end nodes 5 and 8 are routed from switch 2 to switch 3, while the content data streams C and D for end nodes 9 and 11 are routed from switch 2 to switch 4. Switch 3 then routes the data it receives to end nodes 5 and 8, and switch unit 4 routes the data it receives to end nodes 9 and 11. In this system, all four of the data streams A through D must come from content database 13, through server 1, through switch 2, and then through switches 3 and 4. Because of the time critical nature of the multimedia data, all of the components and network interconnections between the content database 13 and the end users must be very high speed, with low latency. The system as in Figures **3A** and **3B** clearly will have its limitations, particularly when there are a large number of end nodes requesting data simultaneously.

Figure **4A** shows a consumer-oriented End Node equipment for viewing digital video on a TV. Its STB contains the cable modem, a storage unit such as disk storage and digital video and audio decompression circuitry. Of course, there is the TV for displaying the program from the cable. Figure **4B** shows PC-oriented equipment for viewing digital video, using either a cable modem or DSL modem for getting the data to the PC with a storage unit, e.g. disk storage.

For a PC-based end node equipment as shown in Figure **4B**, its operation can be controlled by software written in Sun's Java Media Framework (JMF), which can support several Internet protocols called Real Time Protocol (RTP) and Real Time Streaming Protocol (RTSP). These software programs are generally considered "off the shelf" by those skilled in the art and their capabilities are also well understood by those skilled in the art. Java programs can also be written to use the JMF library to facilitate the transfer of data, which can be programmed to support its transmitting end node and another program to support its receiving end node. Those skilled in the art will also appreciate that software may be written for a PC to control the coordinating tasks.

Currently, for a demonstration and prototype unit, the person running the receiving PC installs the Sun Java Development Kit (JDK) software, available for download at http://www.javasoft.com, and the person can then obtain the receiver software, e.g. via electronic mail from the service vendor.

In a production version of the software for operating the end node equipment, an end user can visit the vendor's web site, to install the receive/transmit software on-line. An auto-start software routine can also be installed in the PC's startup directory so that the receive/transmit software can start up when the PC is turned on or rebooted. The installation program can also store personalization information in a special file, to identify the PC and the current PC user, since several people may share a single PC (this special file is commonly known as a "cookie." file).

The following illustrates how an end node equipment may be initialized at start-up. It should be noted that those skilled in the art can readily devise their own initialization routine and protocol while developing their distribution systems in accordance with the present invention. The following discussion is for illustration purposes only. At start-up, the receive/transmit software resident at the end node equipment, e.g. PC, can send a message to the control software on the service provider's web site, acknowledging that it is ready to receive or transmit if requested, as well as sending the identification information. Upon receipt of the acknowledgement, the service provider's control software knows that that particular PC is available.

Once the service provider's server knows that an end unit is available, it can send commands and data to:

- add new content with the end unit receiving command and data;
- delete old content with the end unit receiving a command;
- transmit existing content with the end unit receiving a command;
- check existing content for tampering or perform other maintenance tasks.

In one embodiment, the control software may need to know when a particular PC is no longer available. This scenario may happen when the user shuts the PC down, when the PC crashes, when the user's power fails, or when the cable network simply stops working. If the user shuts the PC down smoothly, i.e. not abruptly, the control software at the PC can be notified of the shutdown, and can send a message back to the server that it will no longer be available.

If the PC crashes or its availability is removed without notification to the provider's server, the distribution system should preferably recover from that without ruining the viewing user's experience. If a series of transfers is being setup, say because a viewer at

another end node unit wants to watch a movie, then the server can immediately check, e.g. poll, with all of the end units that it thinks are available. If any end node unit fails to respond, then the server could mark that end node unit as unavailable, and substitute another end node unit. The initial transfer list would then always start out with end node units that have been confirmed to be available.

Once the movie starts, the receiving PC can be configured to expect data from each transmitting PC by a certain time. If one PC doesn't deliver data by the scheduled time, due to a possible crash, then the receiving PC can notify the provider's server. The server can then immediately substitute another end unit, by giving the substituted end unit the remaining part of the transfer list, and by notifying the receiving unit of the substituted unit's internet address. To ease the transition, the provider may keep a backup server which would provide the delayed content to the receiving end unit for a few seconds, until the substituted end unit is up to speed.

Reference is now to Figure **4C**. As shown in Figure **4C**, the content database13 is set up so that it can offload some of its duties to the whole distribution system. All of the multimedia data is instead distributed among the storage units local in each of the user end nodes (not shown). It may not be necessary for all of the user end nodes to have local storage units, but system performance is improved when more and more user end nodes have storage units and participate in the distribution. Multimedia server 1 now acts as a centralized administrator, keeping track of how the multimedia content is distributed among the user end nodes. The network connection between server 1 and switch 2 now needs much less bandwidth, because only commands and status information are transferred, and not the multimedia data, the storage of which is now distributed among the end nodes. As will be appreciated by those skilled in the art, the storage unit at each end node can be a hard disk drive, or any kind of storage device capable of storing, transferring and playing back its multimedia content. As the prices of the storage devices plummet due to technological maturity, this form of distributed storage becomes more attractive and cost effective.

In the system exemplified in Figure **4C**, end node 5 wants multimedia content A, end node 8 wants multimedia content B, end node 9 wants multimedia content C, and end node 11 wants multimedia content D, while the storage unit of end node 6 contains multimedia content A, the storage unit of end node 9 contains multimedia content B, the

storage unit of end node 10 contains multimedia content C and D, and the storage unit of end node 12 contains multimedia content B.

The distributed storage system, as illustrated in Figure **4C**, can be initialized by the multimedia server 1 directing various contents, e.g. movies, to be transferred from the content database 13, or wherever contents may be available, to the end nodes. The distribution can be based on the anticipated popularity of certain contents and whether the end nodes are within the same switching network. For example, if there are 200 end nodes sharing the same immediate switching network, e.g. in the same neighborhood, a newly released movie may need to be resident at, say, 10 end nodes to provide assured delivery. The delivery can also come from end nodes at other not-so-immediate switching networks, if the delay is not significant. The other 190 end nodes can be populated with other contents, in fragments, in whole or in combination thereof. This is only the initial phase, since as the demands change, the location and distribution can certainly be changed to reflect the usage, which can be tracked using common tools for statistical analysis.

Moreover, the initialization or subsequent location management can be done during off-peak hours, since no intervention from the consumer should be needed. Therefore, at 3 A.M., while most consumers are asleep, the storage units at their end nodes may be quietly receiving instructions, preferably from the central server, transferring contents, or updating the central server. As new contents are released, the new ones will cause the not-so-new contents to be deleted or replaced, either gradually or all at once. The distributed storage system is thus dynamic and able to continue to adequately support the consumers' ever-changing needs.

Because storage of the content is distributed, end node 6 can act as a server for end node 5. If the network connection between the two nodes is a shared medium, then it may be possible for end node 6 to transmit the content A data directly to end node 5, otherwise it can transmit the content A to end node 5 by sending it to switch 3, which will then send it to node 5, using conventional Internet, or any data communications networking, addressing techniques. The multimedia server 1 can preferably act as a "traffic controller" to receive requests from end node 5, check availability of the requested content, determine the most expedient way of transfer, e.g. from end node 6, and command end node 6 to transfer the content A to end node 5.

Still referring to Figure 4C, it may happen that when end node 6 is responding to a request for content A from end node 5, the viewer at end node 6 also requests such content A for playback. In such situation, data can be read out of the storage unit, e.g. hard drive, into the processor's memory, whether it is the PC or the STB. Then the data is transferred out of the processor's memory and out to the cable or DSL network. If the same data is needed at very close to the same time for local viewing, that data is likely still cached in the memory and can be sent to the local display. If it isn't still cached in the memory, then the data can be re-read from the storage unit, e.g. hard drive. As can be appreciated by those skilled in the art, current PC systems with their high speed processors and communications functionality, as well as the STBs, can readily handle two sets of read requests simultaneously.

An alternative to the multimedia server acting as a centralized traffic controller is to let each end node broadcast its request to other end nodes. The end nodes with the requested content will monitor the transmission status to determine if it is the best source for the requested content. If so, it will reply and transmit the requested content to the requester. When there are multiple replies to its request, the requesting end node will determine the priority for receiving and notify the source end node(s) of the priority for transmission. If transmission is bogged down, the requesting node can go to the next source end node according to the priority. The second source end node can transmit to pick up where the first source end node leaves off.

Similarly, end node 9 can act as a server for end node 8, providing it with content B, and at the same time, receives content C from end node 10. End node 10 stores content C and D, and can act as a server by sending content C to end node 9 and simultaneously sending content D to end node 11.

The end nodes do not have to be servers by themselves only. They can work, sequentially or concurrently, with other end nodes to complete a delivery. End node 8 can receive content B from both end node 9 and end node 12. This may be desirable to reduce the transmission time of content B, particularly if the upload (direction from the end node to the switch) speed is lower than the download (switch to end node) speed. This is often the case for cable modems and ADSL (Asymmetric Digital Subscriber Line) network technology. It also can be useful in the situation where the playback of the content starts before the entire content has been downloaded to the end node. For instance, the playback

of content B may have started because it was expected that the download from end node 9 only would complete before the end of the content was reached, based on the speed of the early part of the download from end node 9 to end node 8. However, once playback starts, if the download speed is reduced due to unexpected network congestion from switch 4 to switch 3 or due to unexpected reduction in upload speed from end node 9 to switch 4, then the unviewed portion of content B can also be transferred from end node 12 to end node 8.

By way of an example, suppose that end node 8 has received the first 25% of content B from end node 9. Based on the download rate of this first 25% of the content as well as the playback rate for the content, end node 9 starts the playback. In this example, the playback rate is equal to the download rate. At the 30% reception point, the download rate slows down by a factor of 2. If the download rate is not increased, the playback of content B will be interrupted at the 90% point of the movie or song. At, say the 35% point, end node 12 can be commanded to immediately start transferring the last 20% of content B, and end node 9 can be commanded to continue transferring the content from the 35% point but to stop at the 80% point. This method can be useful where the upload transfer rate or the switch to switch transfer rate is lower than the download transfer rate.

The method of simultaneous, or concurrent, transfer from multiple end nodes can also be used to reduce the playback starting time for a network where the playback data rate and the download data rate are higher than the upload data rate. For instance, suppose the playback rate is 2 megabits per second, the download rate is capable of supporting 3 megabits per second, and the upload speed of a single end node is 1 megabit per second. For the network shown in Figure **5A**, end node 5 wants to play content A, which is stored as a number of different fragments in end nodes 6 through 15. The information on the location of the fragments at the different nodes can preferably be stored on the multimedia server 1. The upload and download capability of the different nodes can also be stored on the multimedia server 1, or there could be an immediate test transfer to determine the upload and download speeds.

Referring to Figure **5A**, end node 5 would contact the multimedia server 1, which would coordinate the transfer of the fragments to end node 5 from the other end nodes. In the first phase, end nodes 6, 7, and 8 would transfer their stored fragments to end node 5, which would receive the three fragments concurrently at 3 megabits per second, even

though the individual fragments from each transmitting end node can be uploaded only at 1 megabit per second. Since the fragment containing 0-5% of the content from end node 6 is being transmitted at half the playback speed, end node 5 could not start playing the content until the first half of the fragment has been received. If it started playing any sooner, the data would run out before the fragment could be fully received, causing a gap in the playback.

It may occasionally happen that the Internet address of the end nodes is not fixed, but can change from time to time. A program on each of the end nodes can be used to inform the controlling multimedia server 1 when its Internet address changes.

When the fragments from end nodes 6, 7, and 8 have been transferred to end node 5, the multimedia server 1 could arrange the transfer of the next 15-30% fragments from other end nodes containing the necessary fragments, such as end nodes 9, 10, and 11, as shown in Figure **5B**. While end nodes 9, 10, and 11 are transmitting data to end node 5, end nodes 6, 7, and 8 would become available to transfer data to a different end node, if needed.

It should be noted that while only one content database and one multimedia server is depicted in Figure **5B** for illustration purposes, the entire distribution system in accordance with the present invention may implement multiple content databases with multiple multimedia servers, scattered throughout the county, state or country. Content going to one end unit may come from one or more content servers as well as from multiple other end units. This "aggregation" effect can offload the burden on any one particular server or database, while providing an efficient scheme to achieve content delivery from databases and servers in proximity of the end units.

Referring to Figure **5B**, when end node 5 has completed viewing content A, its storage unit will have a complete copy of all of the fragments of content A. If content A is expected to be popular with other end nodes, e.g. new releases, the entire content could remain stored on end node 5, so it could be delivered to other end nodes, or just a few portions could be kept. What portions to be kept at this end node can be determined based on the storage, or distribution, situation of content A at other end nodes. For example, the storage situation may be such that only the first 30% fragment of content A is needed, since other end nodes may contain sufficient other fragments. If content A is not

expected to be viewed in the near future, it could be deleted immediately, or designated to be the first content to be deleted when other content needs to be stored in end node 5's storage unit.

Reference is now turned to Figure 7, where a flow diagram depicting the process of distributing content to end node units as directed by the server is described. As shown in Figure 7, end-user unit (EUU1) notifies the central server it is on-line, active and ready, for example, after the EUU1 is first installed at an end-user's house. Upon such notice, the central server transmits data block N to EUU1 for storage. When EUU2 requests data block N from the central server, the central server will notify EUU2 that data block N will be transmitted from EUU1. The central server can thus command EUU1 to transmit the requested data block to EUU2. At this point, the Internet transmit address is EUU1's, while the Internet receiver address is EUU2's. Upon receipt of the requested data block, EUU2 notifies the central server that transmission is now completed.

Reference is now to Figures **8A** and **8B**, where another embodiment of the VOD system in accordance with the present invention is shown. It should be pointed out that in the system previously shown in Figures **5A** and **5B**, a number of end nodes are served by a single multimedia server 1. Figures **8A** and **8B** show an alternative to, or elaboration of, this system, where the multimedia server's function has been split, or essentially off-loaded, into separate parts, and the content is delivered from a combination of end nodes and multimedia content servers. The content delivery is now accomplished by distributed content servers as well as by other end nodes, or the combination of servers and end nodes.

In this system as shown in Figures **8A** and **8B**, the end nodes C and D may be personal computers (PC's) or other equipment which normally reside in a home. Control Server A may be an Internet server computer which performs the control and coordination role. An example of this Internet server computer is a Compaq Proliant server or its equivalent, using the Microsoft NT operating system. Web Server B may be an Internet server computer, an example of which is Sun Microsystems' Enterprise server or its equivalent, using the Sun Solaris operating system, which delivers web pages to end nodes, but which may or may not hold the multimedia content. Multimedia Content Servers E and F may be Internet server computers which hold multimedia content. Although the functions are separated for this example, it is possible for an Internet server

computer to perform and combine the control, web serving, and multimedia content serving functions in any combination, as can be appreciated by those skilled in the art.

Figures **8A** and **8B** show another embodiment of the VOD system, in accordance with the present invention, delivering multimedia data to an end node from a combination of multimedia content servers and end nodes. This embodiment thus makes it possible to build a system which delivers multimedia data to an end node, or multiple end nodes, only from multimedia content servers.

As previously described in the present application, the multimedia content, such as a movie file, may first be fragmented into smaller files, and the smaller files may be distributed for storage by end nodes and/or other servers. For this example, the content fragments would be distributed onto End Node C (step 3), End Node D (step 4), Multimedia Content Server E (step 3), and Multimedia Content Server F (step 3). The present invention also makes it possible to distribute copies of the file fragments to additional end nodes or servers, so that each file fragment may reside on more than one end node or server. This redundancy can allow the substitution of one end node or server for another, which may be useful if an end node or server is slow in transmitting data. The data may reside on these end nodes and servers, and may be transmitted when needed.

Also, as previously described, the viewing end node may contain some software which may re-integrate the file fragments into the original file order. Finally, the end nodes or Internet servers which hold the movie file fragments may contain some software which allows it to accept commands from a control server and to deliver the file fragments to an end node or to an Internet server.

In Figure **8A**, step 1 occurs when a user at End Node D, say, wishes to view a movie. It sends a request to Web Server B for the movie data. In step 2, Web Server B passes the request to Control Server A. Control Server A then determines which end nodes or Internet servers contain the desired movie file fragments. In step 3, Control Server A sends instructions to End Node C, Multimedia Content Server E, and Multimedia Content Server F to deliver the desired movie file fragments to End Node D. In step 4, shown in Figure **8B**, End Node C, Multimedia Content Server E, and Multimedia Content Server F together deliver the movie file fragments to End Node D. It should be pointed that the re-integration, or re-assembly, of the various fragments can be done by the viewing end node, if each fragment is coded to provide unique identification with respect

to other fragments from the same title. Such re-integration or re-assembly may also let the viewing end node obtain a "script" of the fragments to be delivered from the server responding to the viewing end node's initial request. This "script" will facilitate the re-integration and re-assembly of the fragments, much like an instruction manual on how to assemble a bicycle.

It should be pointed out that once a movie title, or a data file, is fragmented, each fragment should have a unique code identifying its position in the full length movie. Preferably a standardized way of position-coding the movie or data file is established, in a similar manner Internet files are packetized and delivered separately throughout the Internet, only to be reassembled at the last point for the reception.

Although it is not shown, it should be apparent to those skilled in the art that it is possible for Web Server B to also act as a multimedia content server.

It should be noted that each fragment of data being stored by an EUU can be encrypted with a different encryption key for security reasons. For example, if an EUU stores 5 fragments from 5 programs, i.e. 1 fragment from 1 program, each fragment can have its own encryption key. Having the fragments or programs encrypted will prevent any unauthorized access of the EUU by its user. As can be appreciated by those skilled in the art, the storage in each EUU is preferably transparent to the user, whether the EUU contains a full-length feature or a collection of fragments of various contents.

In accordance with the above disclosure, the present invention provides continuous playback of content, with a minimal amount of waiting, even though the upload transmission rate of content from a single end node is lower than the playback and download rates of the playing end node by fragmenting the content and distributing the content among a large number of networked storage nodes. The present invention also allows multiple end nodes to view the same content, with a small delay between each viewing, where the delay is set by the time duration of a fragment. The present invention can be used with any means of two way transmission of data. For instance, the network could use DSL (digital subscriber line) technology shown in Figure **6**, instead of, or in conjunction with, the cable TV technology shown in Figure **1.**

While the present invention for data delivery has largely been described in terms of implementing a video-on-demand system with distributed storage, it should be appreciated

by those skilled in the art the present invention can also implement a "data-on-demand" system. In such a system, the storage unit at each end-user's site will store data for access by other users or by itself. The stored data can also be portions, or fragments, of distinct kinds of data, which can be assembled with other portions stored elsewhere to form a complete piece, provided there is mechanism, e.g. via a central server, to control, track and manage the storage, transmission and assembly of the data. Also, it may behoove those who manage such networks to implement data security and encryption measures to prevent the uninvited access of stored data by the end-user.

The invention may be conveniently implemented using a conventional general purpose digital computer and programmed according to the teachings of the present invention, as will be apparent to those skilled in the art. Appropriate software coding can readily be done by skilled programmers based on the teachings of the present disclosure, as will be apparent to those skilled in the software art.

The invention may also be implemented by the preparation of application specific integrated circuits or by interconnecting an appropriate network of conventional component circuits, as will be readily apparent to those skilled in the art.

The present invention also includes a computer program product which is a storage medium including instructions which can be used to program a computer to perform a process of the invention, such as the storage of the distributed programs, or the content flow control of the distribution network. The storage medium can include, without limitation, any type of disk including floppy disks, optical disks, CD-ROMs and magneto-optical disks, ROMs, RAMs, EPROMs, EEPROMs, magnetic or optical cards, or any type of media suitable for storing electronic instructions. As an apparatus embodying the present invention is operated, the device processes signals which are physical phenomena and control the device in a appropriate manner so that the desired results of the invention are achieved.

Obviously, numerous modifications and variations of the present invention are possible in light of the above teachings. It is therefore to be understood that within the scope of the appended claims, the invention may be practiced otherwise than as specifically described herein.

What is claimed is:

1. A data on-demand system for delivering data on-demand to a requesting end-user unit ("Requesting EUU") in a communications network, comprising:

a plurality of end-user units ("EUUs"), at least one of said EUU ("First Source EUU") adapted to receive a data file through said communications network, to store said data file and to transmit said data file through said communications network;

a server adapted to direct transmission of data files through said communications network among said plurality of EUUs,

wherein said server and said First Source EUU are adapted:

to permit said server to transmit said data file through said communications network to said First Source EUU;

to store said data file in said First Source EUU; and

to permit said server, in response to an instruction received from said Requesting EUU, to cause said First Source EUU to transmit said data file through said communications network to said Requesting EUU.

2. A data on-demand system as in Claim 1, wherein said server is additionally adapted to track information regarding the location of said data file at said First Source EUU.

3. A data on-demand system as in Claim 1, wherein said data file comprises at least one of the following:

an integral multimedia program;

at least one fragment of an integral multimedia program;

a combination of fragments of a plurality of integral multimedia programs.

4. A system according to Claim 1, further comprising a Second Source EUU, wherein:

said Second Source EUU is adapted to receive and store said data file as said data file is stored by said First Source EUU; and

said server and said Second Source EUU are adapted to cause said Second Source EUU to begin transmitting said data file to said Requesting EUU when transmission from said First Source EUU meets one or more of predetermined criteria.

5. A system according to Claim 1, wherein said server is adapted to cause said First Source EUU to replace said data file in storage with at least one other data file based on at least one predetermined criterion.

6. A server for managing and delivering data files on-demand to a plurality of end-user units ("EUUs") connected through a data communications network, the server comprising:

a central processing unit ("CPU");

a memory operatively connected to said CPU, said memory containing a program adapted to be executed by said CPU, wherein:

said CPU and said memory operatively adapted to distribute a plurality of data files to said plurality of EUUs for storage based on at least one of predetermined criteria, while tracking the locations of said data files at said plurality of EUUs,

said CPU and said memory operatively adapted to receive a demand from a first EUU for at least one data file,

said CPU and said memory operatively adapted to locate said at least one data file at a second EUU and to instruct said second EUU to transmit said at least one data file to said first EUU according to said demand.

7. A server according to Claim 6, wherein:

said CPU and said memory operatively adapted to receive a demand from a third EUU for a combination of a first data file and a second data file,

said CPU and said memory operatively adapted to locate said first data file stored at a fourth EUU and said second data file stored at a fifth EUU,

said CPU and said memory operatively adapted to instruct said fourth and fifth EUUs to transmit said first and second data files to said third EUU according to said demand.

8. A server according to Claim 7, wherein said combination of first and second data files demanded by said third EUU constitute 2 fragments from an integral data file.

9. A server according to Claim 7, wherein:

said CPU and said memory operatively adapted to locate and manage a plurality of data files and sequence transmission of said data files according to demands.

10. A server according to Claim 6, wherein:

said CPU and said memory operatively adapted to track usage information among said plurality of EUUs;

said CPU and said memory operatively adapted to re-distribute data files among said plurality of EUUs for storage in response to said usage information;

said CPU and said memory operatively adapted to add new data files for distribution among said plurality of EUUs for storage when said new data files are available.

11. An end-user unit for a data on-demand system, comprising:

a processor;

a modem adapted to connect with a data communications network to receive a data file, said modem also adapted to transmit at least a portion of said data file through said data communication network to a second end-user unit specified by the server;

a storage unit adapted to store said data file in response to an instruction from a server connected to the data communication network.

12. A method of delivering at least one data file on-demand from a central storage to a plurality of end-user units ("EUUs") through a communications network, comprising:

a) storing at least one data file at said central storage;

b) initializing a first EUU by transmitting at least a portion of said data file to said first EUU;

c) storing said portion of data file at said first EUU;

d) tracking information regarding location of said portion of data file;

e) determining location for said portion of data file, when a second EUU issues a demand for said data file;

f) issuing instruction to said first EUU for said portion of data file stored at said first EUU;

g) upon receipt of said instruction, said first EUU transmitting said portion of data file to said second EUU.

13. The method according to Claim 12, the method further comprising:

a) initializing a third EUU by transmitting at least said portion of data file to a third EUU for storage;

b) tracking information regarding location of said data file at said third EUU;

c) monitoring transmission from said first EUU to said second EUU;

d) if transmission from said first EUU to said second EUU falls below a predetermined criterion, issuing instruction to said third EUU for

transmission of said portion of data file to said second EUU and issuing instruction to said first EUU to terminate its transmission;

e) upon receipt of said instruction, said third EUU transmitting said portion of data file to said second EUU.

14. A method of delivering at least one data file on-demand to at least one of a plurality of end-user units ("EUUs") through a communications network, comprising:

a) providing a plurality of data files accessible through said communications network;

b) distributing said plurality of data files to a plurality of EUUs for storage;

c) tracking information regarding respective storage locations of said plurality of data files at said plurality of EUUs;

d) when a requesting EUU issues a demand for at least one of said plurality of data files, locating at least one EUU storing said at least one of said plurality of data files from said plurality of EUUs based on at least one of predetermined criteria;

e) causing the identified EUU to transmit said at least one data file to said requesting EUU.

15. The method according to Claim 14, wherein said predetermined criteria in the step d) of identifying comprises at least one of the following criteria:

quality of transmission between each of said plurality of EUUs to said second EUU;

proximity of each of said first plurality of EUUs relative to said second EUU;

needs of each of said plurality of EUUs relative to a second plurality of EUUs.

16. The method according to Claim 14, wherein said plurality of data files comprises multimedia programs and data.

17. A method of delivering multimedia programs on-demand from a remote storage to a plurality of end-user units ("EUUs") through a communications network, comprising the steps of:

a) storing at least one multimedia program at said remote storage;

b) initializing a first EUU by transmitting at least a first portion of said multimedia program to said first EUU;

c) storing said first portion of said multimedia program at said first EUU;

d) initializing a second EUU by transmitting at least a second portion of said multimedia program to said second EUU;

e) storing said second portion of said multimedia program at said second EUU;

f) tracking information regarding storage locations of said first and second portions of said multimedia program at said first EUU and second EUU;

g) when a third EUU issues a demand for said multimedia program, directing said first and second portions of said multimedia program to be transmitted to said third EUU;

h) upon receipt of said first and second portions of said multimedia program, said third EUU assembling said multimedia program for downloading.

18. The method according to Claim 17, wherein said multimedia program comprises at least one of video programs, audio programs or movie programs.

19. The method according to Claim 17, wherein each portion of said multimedia program is encrypted with a predetermined encrypted key.

20. In a data communication network with a plurality of clients and servers, a method of delivering at least one data file from a plurality of data files on demand to a first client, comprising the steps of:

a) distributing said plurality of data files to at least one of said plurality of clients and servers for storage based on a predetermined distribution scheme;

b) tracking each of said data files as to its location;

c) upon receiving a request for one of said plurality of data files from said first client;

d) locating from at least one of said clients and said servers storing said requested data file;

e) instructing at least one of said clients and said servers to transmit said requested data file to said first client.

**21**. The method according to claim **20**, wherein said predetermined distribution scheme is based on at least one of: location of the clients and servers, and popularity of the data files.

**22**. A method of conducting a VOD service using a communications network, comprising the steps of:

a) providing a plurality of movies which are accessible through at least one server in said communications network;

b) distributing a plurality of set-top boxes ("STBs") to a plurality of clients, at least a portion of the STBs being capable of storing, presenting and transmitting said movies upon a predetermined request;

c) storing the plurality of movies, in fragments or in whole, throughout said STBs and said at least one server, and keeping track of the locations of the fragments of said movies;

d) upon request from one of the clients for a movie from said plurality of movies, locating said movie, in fragments or in whole;

e) upon locating said movie, in fragments or in whole, among said STBs and said at least one server, causing said movie, in fragments or in whole, to be delivered to the requesting client.

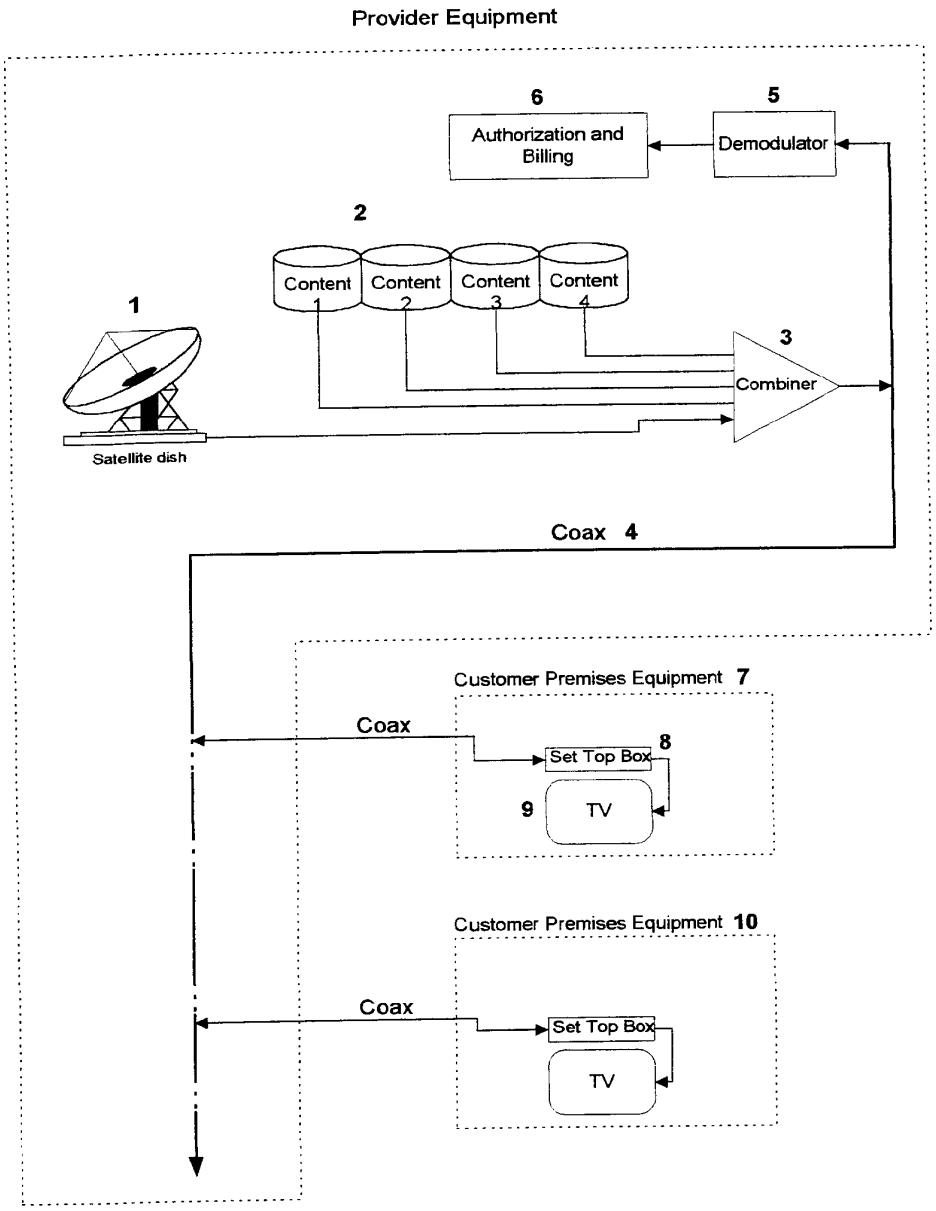

Provider Equipment
6
Authorization and Billing
5
Demodulator
2
Content 1
Content 2
Content 3
Content 4
1
3
Combiner
Satellite dish
Coax 4
Customer Premises Equipment 7
Coax
8
Set Top Box
9
TV
Customer Premises Equipment 10
Coax
Set Top Box
TV

Figure 1A

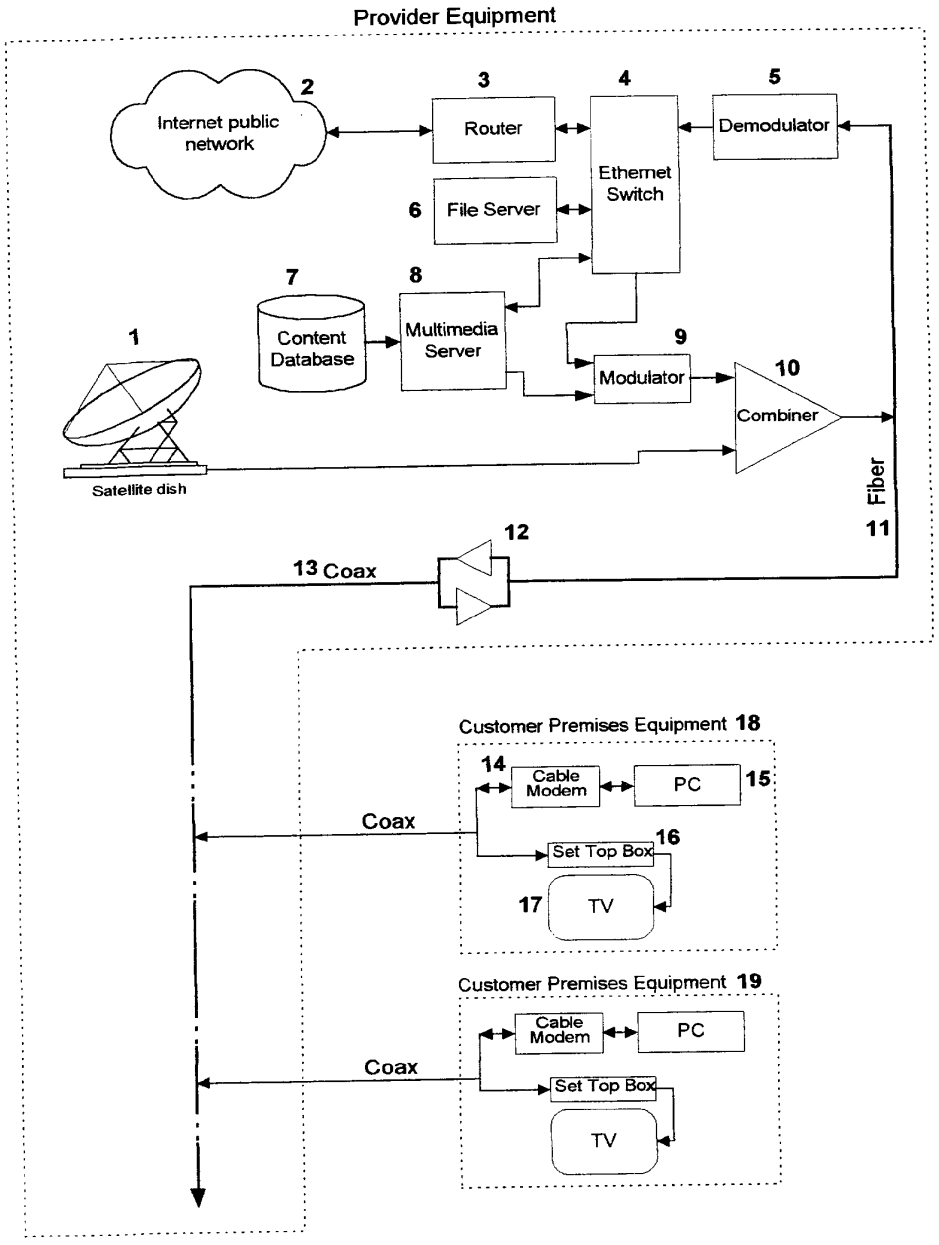

Provider Equipment
Internet public network
2
3
Router
4
Ethernet Switch
5
Demodulator
6
File Server
7
Content Database
8
Multimedia Server
9
Modulator
10
Combiner
1
Satellite dish
Fiber
11
12
13 Coax
Customer Premises Equipment 18
14
Cable Modem
PC
15
Coax
16
Set Top Box
17
TV
Customer Premises Equipment 19
Cable Modem
PC
Coax
Set Top Box
TV

**Figure 1B**

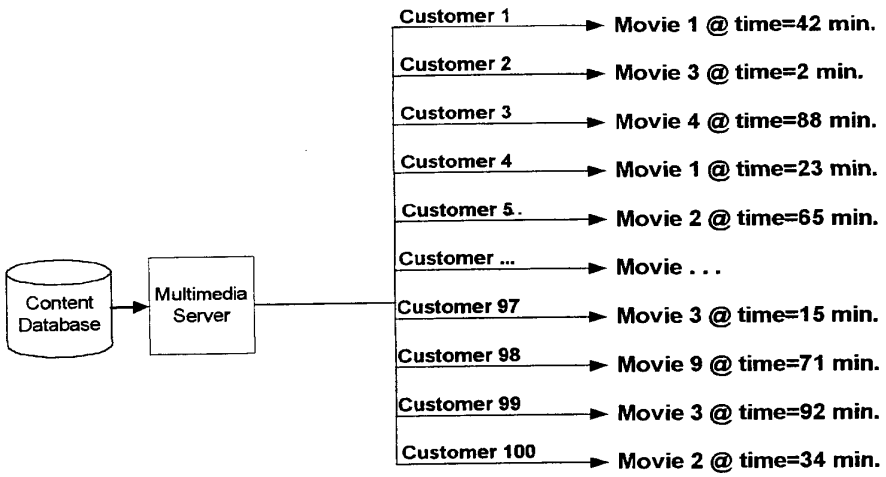



Figure 2A

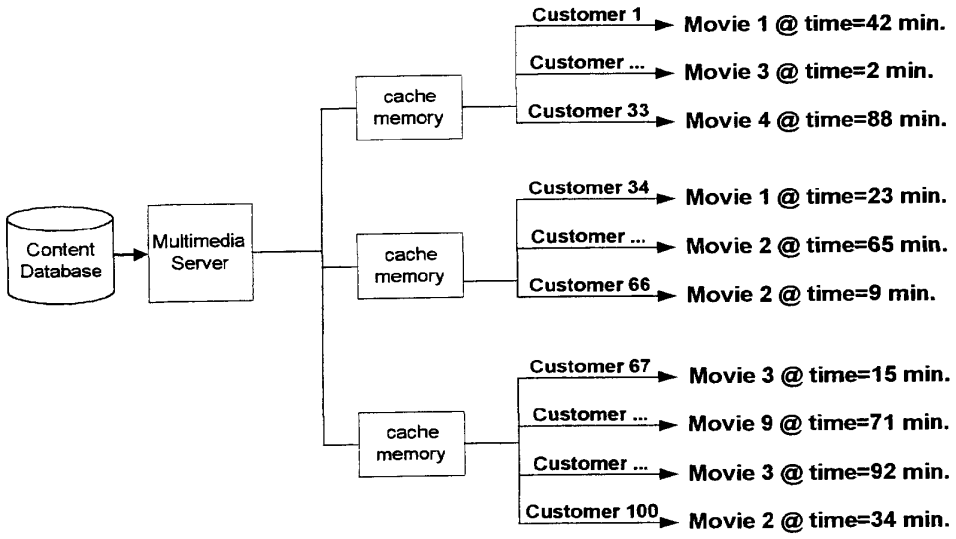



Figure 2B

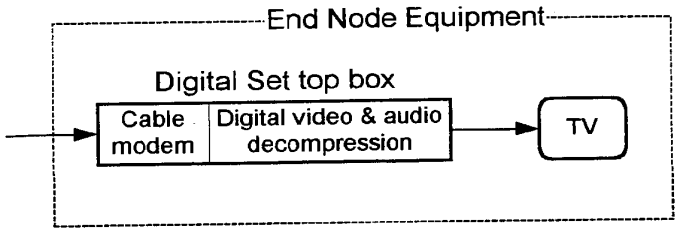



**Figure 3A - Conventional End Node Equipment**

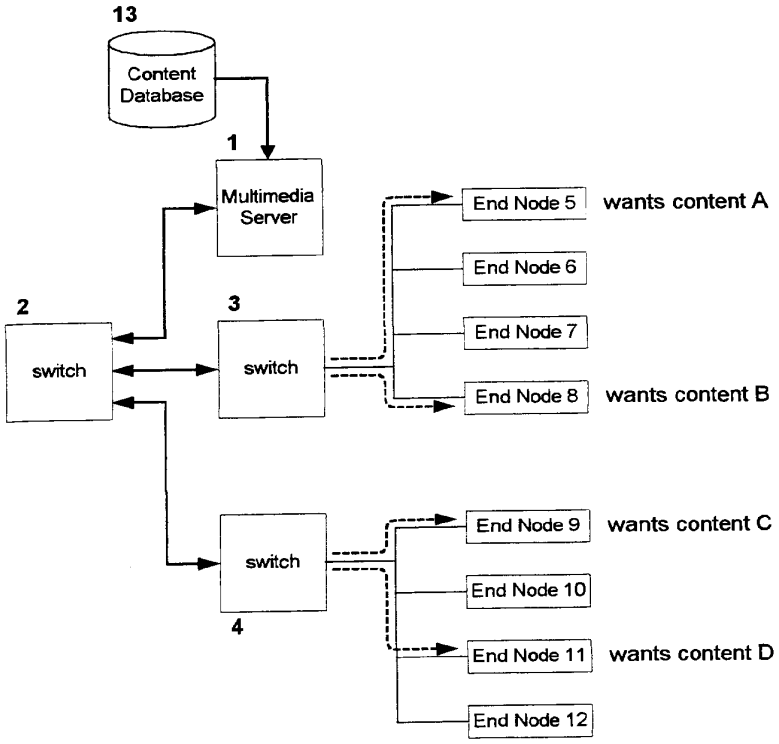



**Figure 3B**

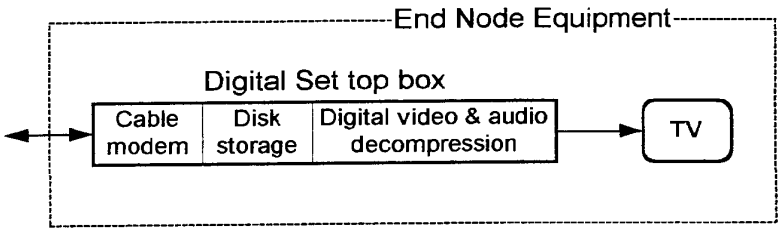



**Figure 4A**

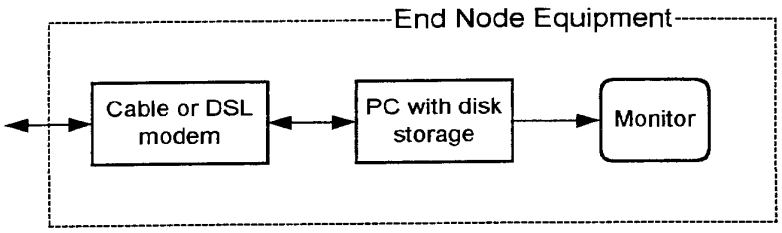



**Figure 4B**

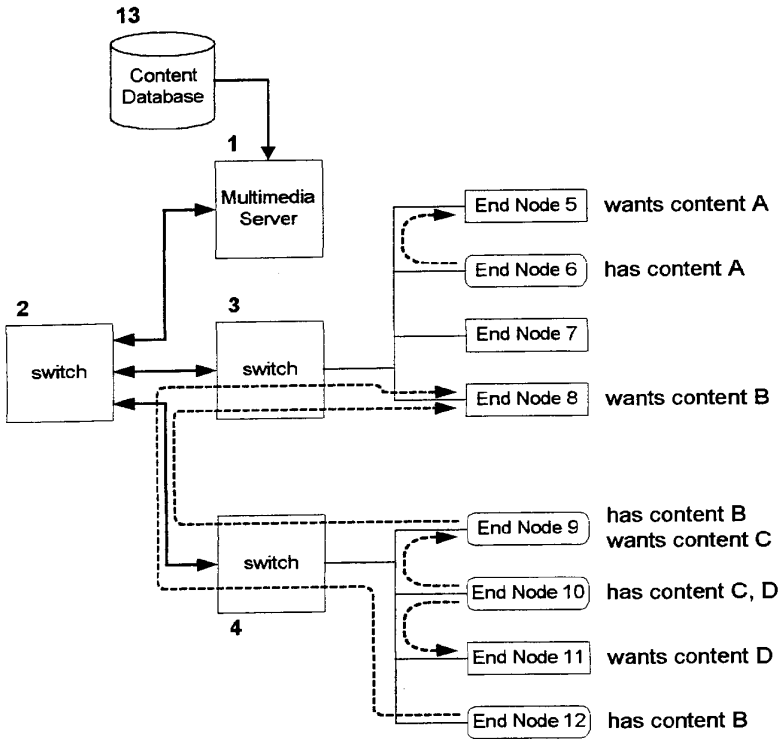

13
Content Database
1
Multimedia Server
2
switch
3
switch
4
switch
End Node 5
wants content A
End Node 6
has content A
End Node 7
End Node 8
wants content B
End Node 9
has content B
wants content C
End Node 10
has content C, D
End Node 11
wants content D
End Node 12
has content B

**Figure 4C**

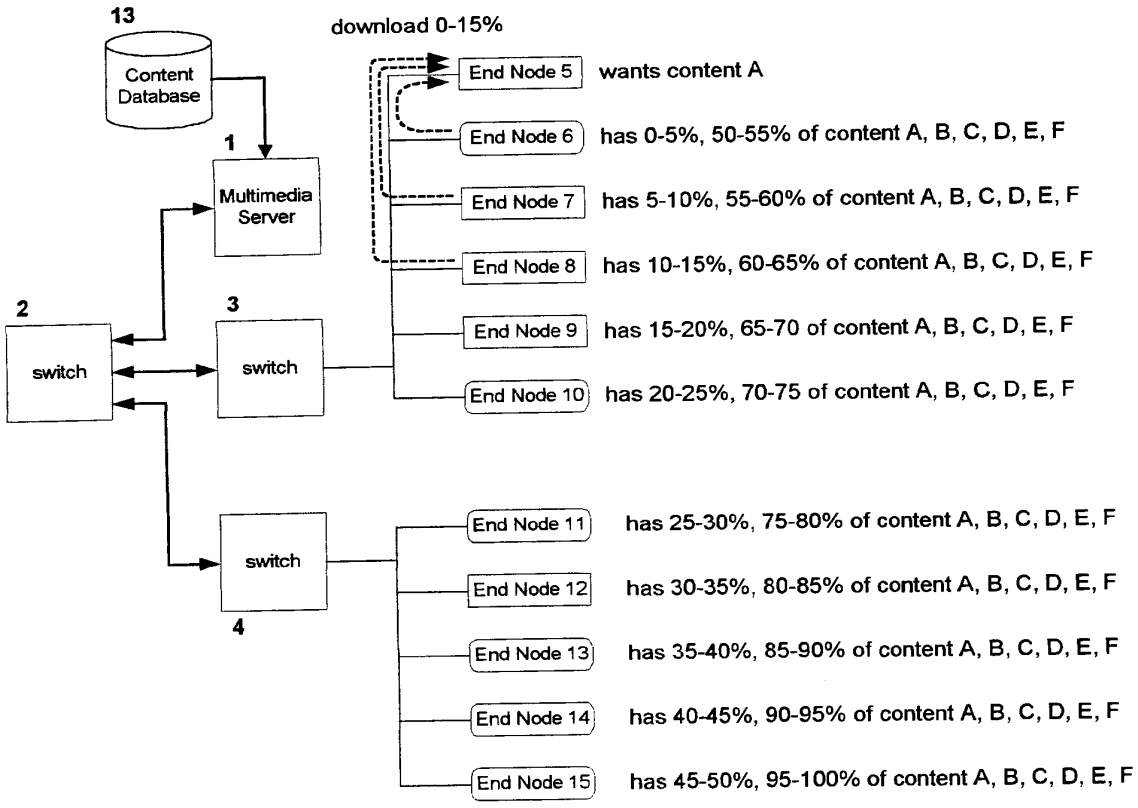

13
Content Database
download 0-15%
1
Multimedia Server
2
switch
3
switch
4
switch
End Node 5
wants content A
End Node 6
has 0-5%, 50-55% of content A, B, C, D, E, F
End Node 7
has 5-10%, 55-60% of content A, B, C, D, E, F
End Node 8
has 10-15%, 60-65% of content A, B, C, D, E, F
End Node 9
has 15-20%, 65-70 of content A, B, C, D, E, F
End Node 10
has 20-25%, 70-75 of content A, B, C, D, E, F
End Node 11
has 25-30%, 75-80% of content A, B, C, D, E, F
End Node 12
has 30-35%, 80-85% of content A, B, C, D, E, F
End Node 13
has 35-40%, 85-90% of content A, B, C, D, E, F
End Node 14
has 40-45%, 90-95% of content A, B, C, D, E, F
End Node 15
has 45-50%, 95-100% of content A, B, C, D, E, F

**Figure 5A**

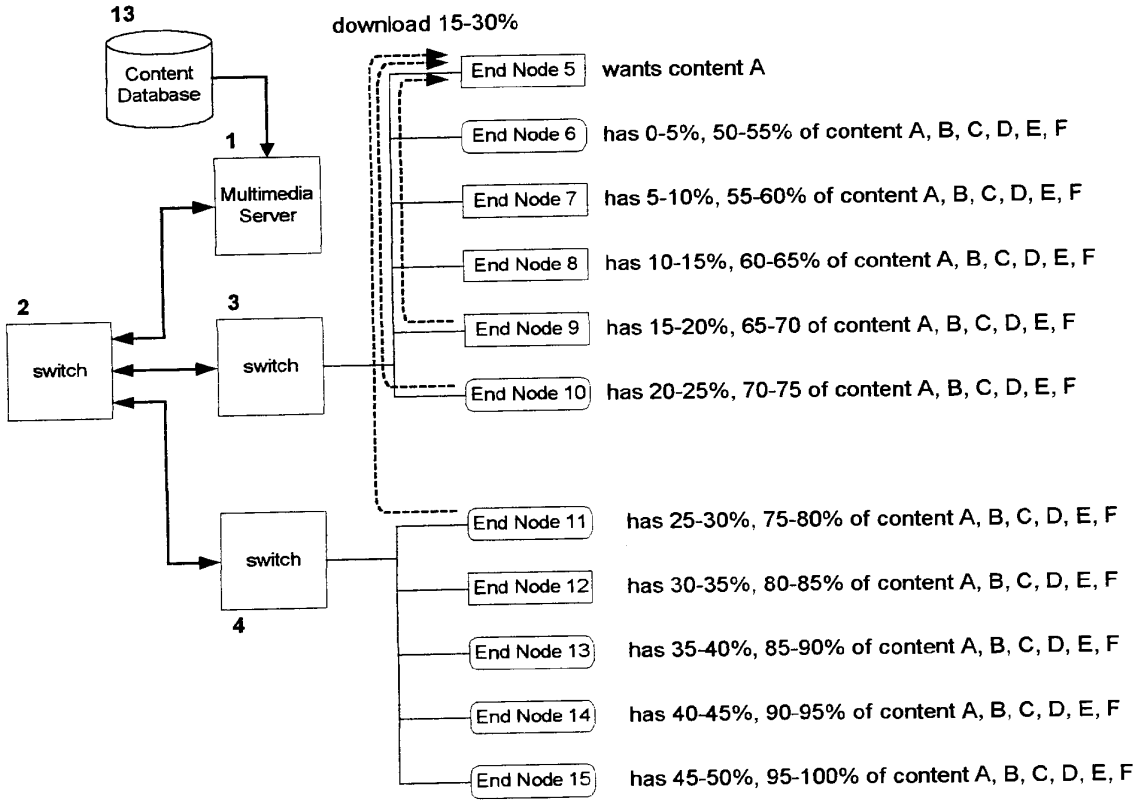

13
Content Database
1
Multimedia Server
2
switch
3
switch
4
switch
download 15-30%
End Node 5
wants content A
End Node 6
has 0-5%, 50-55% of content A, B, C, D, E, F
End Node 7
has 5-10%, 55-60% of content A, B, C, D, E, F
End Node 8
has 10-15%, 60-65% of content A, B, C, D, E, F
End Node 9
has 15-20%, 65-70 of content A, B, C, D, E, F
End Node 10
has 20-25%, 70-75 of content A, B, C, D, E, F
End Node 11
has 25-30%, 75-80% of content A, B, C, D, E, F
End Node 12
has 30-35%, 80-85% of content A, B, C, D, E, F
End Node 13
has 35-40%, 85-90% of content A, B, C, D, E, F
End Node 14
has 40-45%, 90-95% of content A, B, C, D, E, F
End Node 15
has 45-50%, 95-100% of content A, B, C, D, E, F

**Figure 5B**

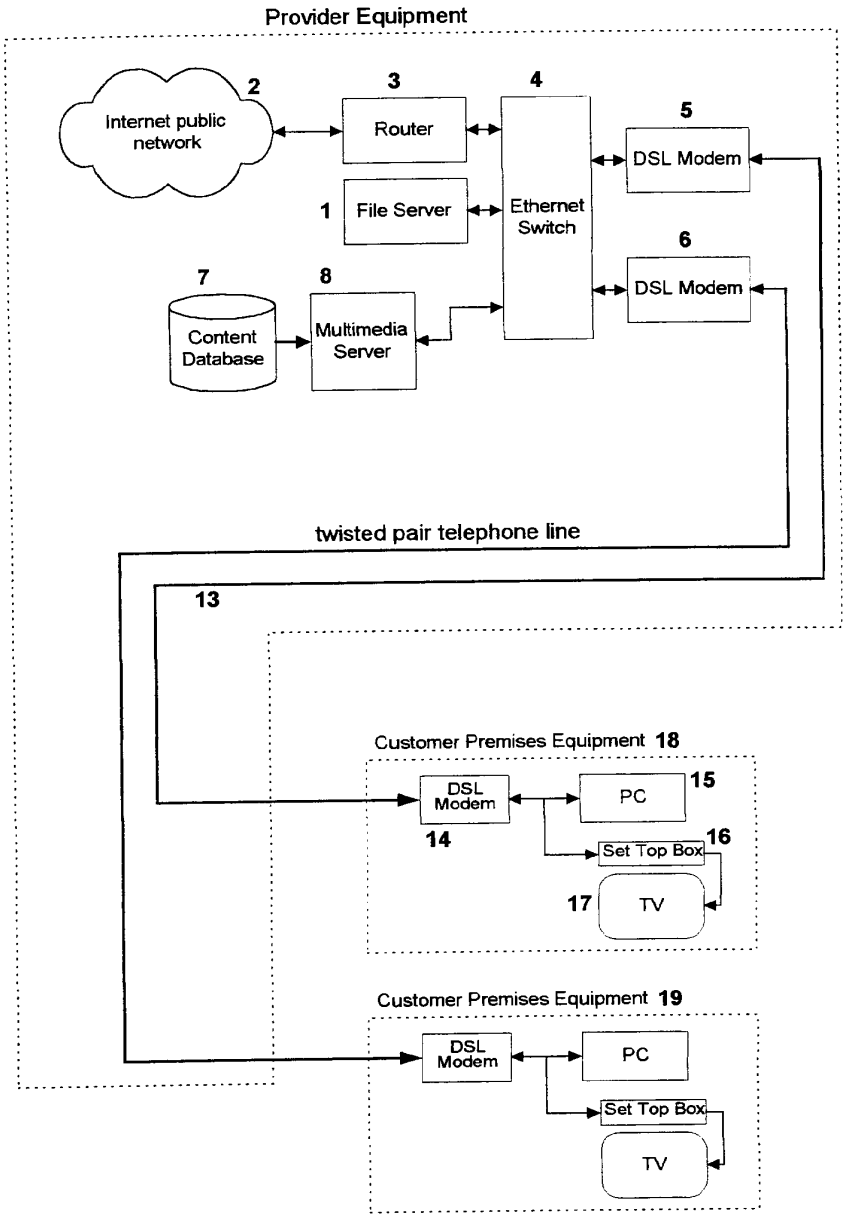

Provider Equipment
Internet public network
2
3
Router
4
Ethernet Switch
5
DSL Modem
1
File Server
6
DSL Modem
7
Content Database
8
Multimedia Server
twisted pair telephone line
13
Customer Premises Equipment 18
DSL Modem
PC
15
14
Set Top Box
16
17
TV
Customer Premises Equipment 19
DSL Modem
PC
Set Top Box
TV

**Figure 6**

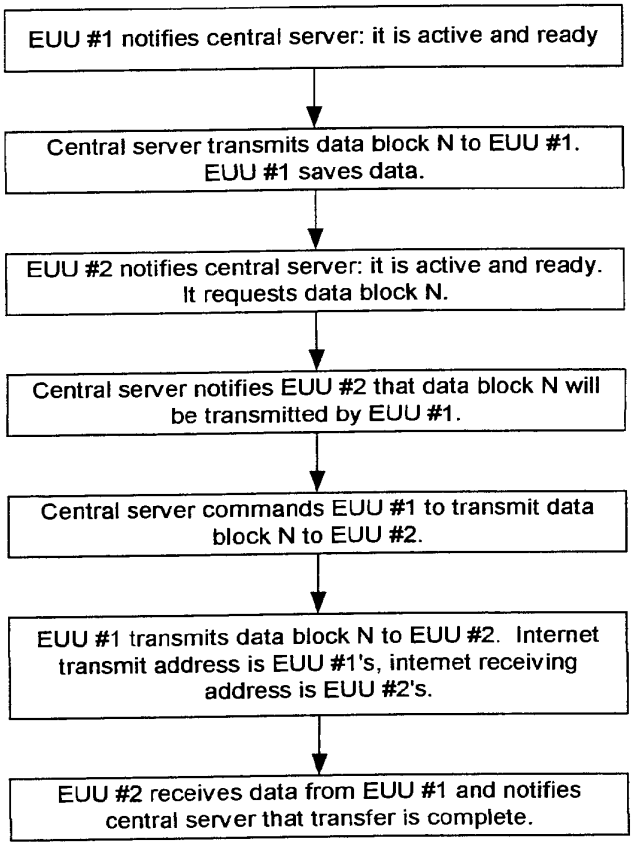

EUU #1 notifies central server: it is active and ready
Central server transmits data block N to EUU #1. EUU #1 saves data.
EUU #2 notifies central server: it is active and ready. It requests data block N.
Central server notifies EUU #2 that data block N will be transmitted by EUU #1.
Central server commands EUU #1 to transmit data block N to EUU #2.
EUU #1 transmits data block N to EUU #2. Internet transmit address is EUU #1's, internet receiving address is EUU #2's.
EUU #2 receives data from EUU #1 and notifies central server that transfer is complete.

**Figure 7**

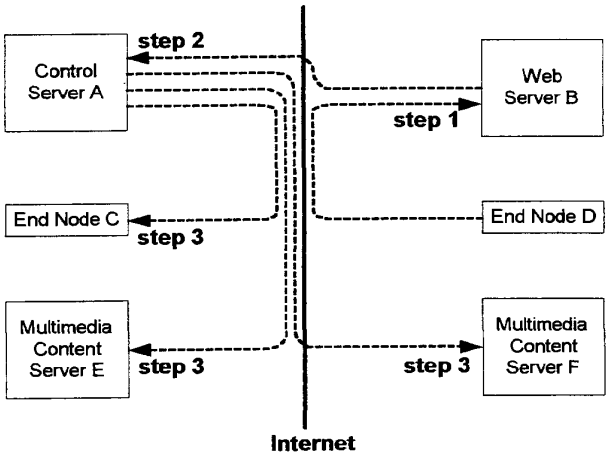



Figure 8A

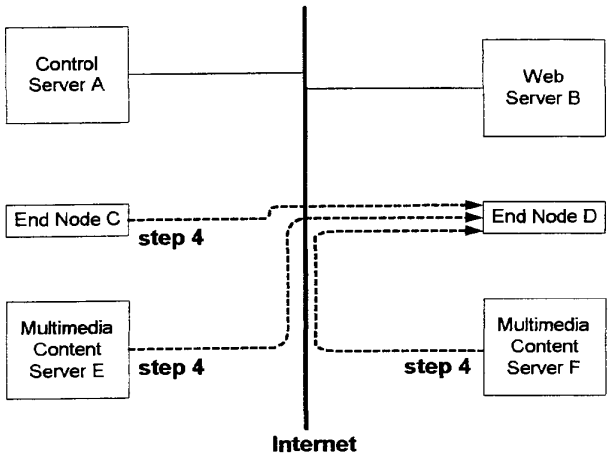



Figure 8B

# INTERNATIONAL SEARCH REPORT

International application No.
PCT/US00/21127

**A. CLASSIFICATION OF SUBJECT MATTER**

IPC(7) :H04N 7/173
US CL :709/219

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. : 709/219; 345/327; 348/7,12,13; 455/4.2, 5.1; H04N 7/173, 7/16

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. |
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| A | US 5,873,022 A (HUIZER et al.) 16 February 1999 whole document | 1-22 |
| A | US 5,884,141 A (INOUE et al.) 16 March 1999 whole document | 1-22 |

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| Date of the actual completion of the international search<br>10 NOVEMBER 2000 | Date of mailing of the international search report<br>08 JAN 2001 |
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|---|---|
| Application Number | 13864248 |
| Filing Date | 2013-04-17 |
| First Named Inventor | NICHOLAS; A. J. Millington |
| Art Unit | 2442 |
| Examiner Name | SURVILLO, OLEG |
| Attorney Docket Number | 13-0401 (MBHB 15-517-CON) |

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| | Filing Date | 2013-04-17 |
| | First Named Inventor | NICHOLAS; A. J. Millington |
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| | Examiner Name | SURVILLO, OLEG |
| | Attorney Docket Number | 13-0401 (MBHB 15-517-CON) |

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| | Application Number | 13864248 |
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| | Examiner Name | SURVILLO, OLEG |
| | Attorney Docket Number | 13-0401 (MBHB 15-517-CON) |

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| | 11 | 20050166135 | | 2005-07-28 | BURKE; David G. et al. | |
| | 12 | 20060193454 | | 2006-08-31 | ABOU-CHAKRA RABIH . et al. | |

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| | 2 | "BAUDISCH et al., "Flat Volume Control: Improving Usability by Hiding the Volume Control Hierarchy in the User Interface", 2004, 8 pages.". | ☐ |
| | 3 | "CHAKRABARTI et al., "A Remotely Controlled Bluetooth Enabled Environment", IEEE, 2004, pp. 77-81.". | ☐ |
| | 4 | "SCHMANDT et al., "Impromptu: Managing Networked Audio Applications for Mobile Users", 2004, 11 pages.". | ☐ |

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| | Art Unit | 2442 |
| | Examiner Name | SURVILLO, OLEG |
| | Attorney Docket Number | 13-0401 (MBHB 15-517-CON) |

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| | 6 | "Final Office Action mailed on 11 August 2015, issued in connection with U.S. Patent Application No. 13/864247, filed on 17 April 2013, 15 pages". | ☐ |
| | 7 | "Final Office Action mailed on 15 July, 2015, issued in connection with U.S. Patent Application No. 14/504812, filed on 2 October 2014, 18 pages". | ☐ |
| | 8 | "Final Office Action mailed on 3 August 2015, issued in connection with U.S. Patent Application No. 13/848921, filed on 22 March 2013, 13 pages". | ☐ |
| | 9 | "FULTON et al., "The Network Audio System: Make Your Application Sing (As Well As Dance)!", The X Resource, 1994, 14 pages.". | ☐ |
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| | Examiner Name | SURVILLO, OLEG |
| | Attorney Docket Number | 13-0401 (MBHB 15-517-CON) |

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| | 16 | "Notice of Allowance mailed on 17 July 2015, issued in connection with U.S. Patent Application No. 13/864251, filed on 17 April 2013, 20 pages". | ☐ |
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| | 19 | "Notice of Allowance mailed on 30 July 2015, issued in connection with U.S. Patent Application No. 13/705178, filed 5 December 2012, 18 pages". | ☐ |
| | 20 | "Notice of Allowance mailed on 4 August 2015, issued in connection with U.S. Patent Application No. 14/516867, filed on 17 October 2014, 13 pages". | ☐ |
| | 21 | "Notice of Allowance mailed on 5 August 2015, issued in connection with U.S. Patent Application No. 13/435776, filed on 30 March 2012, 26 pages". | ☐ |
| | 22 | "NUTZEL et al., "Sharing Systems for Future HiFi Systems", IEEE, 2004, 9 pages.". | ☐ |
| | 23 | "Re-Exam Final Office Action mailed on 5 August 2015, issued in connection with U.S. Patent Application No. 90/013423, filed on 5 January 2015, 25 pages.". | ☐ |

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| INFORMATION DISCLOSURE STATEMENT BY APPLICANT ( Not for submission under 37 CFR 1.99) | | |
|---|---|---|
| | Application Number | 13864248 |
| | Filing Date | 2013-04-17 |
| | First Named Inventor | NICHOLAS; A. J. Millington |
| | Art Unit | 2442 |
| | Examiner Name | SURVILLO, OLEG |
| | Attorney Docket Number | 13-0401 (MBHB 15-517-CON) |

**CERTIFICATION STATEMENT**

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☐ That each item of information contained in the information disclosure statement was first cited in any communication from a foreign patent office in a counterpart foreign application not more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(1).

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☐ See attached certification statement.

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☒ A certification statement is not submitted herewith.

**SIGNATURE**

A signature of the applicant or representative is required in accordance with CFR 1.33, 10.18. Please see CFR 1.4(d) for the form of the signature.

| Signature | /Benjamin M. Urban/ | Date (YYYY-MM-DD) | 2015-08-21 |
|---|---|---|---|
| Name/Print | Benjamin M. Urban | Registration Number | 71,591 |

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| **EFS ID:** | 23280415 |
| **Application Number:** | 13864248 |
| **International Application Number:** | |
| **Confirmation Number:** | 5095 |
| **Title of Invention:** | SYSTEM AND METHOD FOR SYNCHRONIZING OPERATIONS AMONG A PLURALITY OF INDEPENDENTLY CLOCKED DIGITAL DATA PROCESSING DEVICES |
| **First Named Inventor/Applicant Name:** | Nicholas A. J. Millington |
| **Customer Number:** | 107361 |
| **Filer:** | Benjamin Michael Urban |
| **Filer Authorized By:** | |
| **Attorney Docket Number:** | 13-0401 (MBHB 15-517-CON) |
| **Receipt Date:** | 22-AUG-2015 |
| **Filing Date:** | 17-APR-2013 |
| **Time Stamp:** | 00:08:03 |
| **Application Type:** | Utility under 35 USC 111(a) |

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## File Listing:

| Document Number | Document Description | File Name | File Size(Bytes)/ Message Digest | Multi Part /.zip | Pages (if appl.) |
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| 1 | Information Disclosure Statement (IDS) Form (SB08) | 13-0401_MBHB15-517-CON_IDS.pdf | 708555<br>1222798962042 82cf67878c580b910bbce4674a2 | no | 7 |
| **Warnings:** | | | | | |
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| 2 | Non Patent Literature | 14184522_Advisory_Action_7-28-15.pdf | 277143<br>cd2ccb4614aeace6d2215b699fe19d3c744c2235 | no | 7 |
| **Warnings:** | | | | | |
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| 3 | Non Patent Literature | Baudisch_2004.pdf | 1634079<br>7dc98c02c560a3fe87bfb8baef36ba2a88a2a33f | no | 8 |
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| 4 | Non Patent Literature | Chakrabarti_2004.pdf | 261907<br>80f1076f7b536daab366329f36023ce0422508ba | no | 6 |
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| 5 | Non Patent Literature | Schmandt_2004.pdf | 199894<br>556fdacc53c12d34b9c9196ee4b78a7a456fb346 | no | 11 |
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| 7 | Non Patent Literature | 13864247_Final_OA_8-11-15.pdf | 469907<br>0fab6ebb91c6d480b5a98d92c99af60cabdb3601 | no | 15 |
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| 8 | Non Patent Literature | 14504812_Final_OA_7-15-15.pdf | 623847<br>3f75014af5e9cc22cfbf0c619bc10e1aa1dbe387 | no | 18 |
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| 9 | Non Patent Literature | 13848921_Final_OA_8-3-15.pdf | 403416<br>0835c4b7ac6416edb99574457aa682f551ad1187 | no | 13 |
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| 10 | Non Patent Literature | Fulton_1994.pdf | 14955802<br>8a42addee1d95283960f1ee29281968ce42490e9 | no | 14 |
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| 11 | Non Patent Literature | Hans_2003.pdf | 283855<br>ba497c6f551662aa74ff886aaf5a91aaba603ce0 | no | 7 |
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| 12 | Non Patent Literature | Levergood_1993.pdf | 4533927<br>fb568c2696cc13ab411107b040b3171bf8be9f47 | no | 109 |
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| 13 | Non Patent Literature | 13848904_NOA_8-10-15.pdf | 448807<br>8ec25b86487a7837c9dd44680addeadd087f4c56 | no | 9 |
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| 14 | Non Patent Literature | 13435739_NOA_8-12-15.pdf | 1047019<br>356827d2bf036a801bee8ace6c3b0ec1d74e2435 | no | 27 |
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| 15 | Non Patent Literature | 14184526_NOA_7-13-15.pdf | 874907<br>d31da685d555a19490ed36cc426930b1e08e9cf0 | no | 22 |
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| 17 | Non Patent Literature | 13864251_NOA_7-17-15.pdf | 770290<br>85c20404af42c40d4dd557d41c27f4f9cd322c29 | no | 20 |
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| 18 | Non Patent Literature | 13359976_NOA_7-29-15.pdf | 1036691<br>cec3a24f34a1aa66bc1acacc918278cd7a63a9ce | no | 28 |
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| 19 | Non Patent Literature | 14186850_NOA_7-29-15.pdf | 481117<br>79d87c39d3a3012f5eb30efb6d86e0a96194193d | no | 9 |
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| 20 | Non Patent Literature | 13705178_NOA_7-30-15.pdf | 747680<br>b29e96b4c7c9a63ea20c043e74a9575abac82d80 | no | 18 |
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| 21 | Non Patent Literature | 14516867_NOA_8-4-15.pdf | 572153<br>dfd63171cb561f6072693517b3cfb82e7bf1b130 | no | 13 |
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| **Information:** | | | | | |
| 22 | Non Patent Literature | 13435776_NOA_8-5-15.pdf | 961714<br>beb431d30ebdcf39b068cc88a8dd58fb6dfe5d41 | no | 26 |
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| 23 | Non Patent Literature | Nutzel_2004.pdf | 519128<br>576094b8a2d664dd28b5bf27916f0542fba77d80 | no | 9 |
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| 24 | Non Patent Literature | 90013423_Final_OA_8-5-15.pdf | 923527<br>ad54e0ca75e7669e0163e0562fb7468dbb6d9d17 | no | 25 |
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**INFORMATION DISCLOSURE STATEMENT BY APPLICANT**
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|---|---|
| Application Number | 13864248 |
| Filing Date | 04-17-2013 |
| First Named Inventor | NICHOLAS; A. J. Millington |
| Art Unit | 2442 |
| Examiner Name | SURVILLO, OLEG |
| Attorney Docket Number | 13-0401 (MBHB 15-517-CON) |

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| Examiner Initial* | Cite No | Patent Number | Kind Code[1] | Issue Date | Name of Patentee or Applicant of cited Document | Pages,Columns,Lines where Relevant Passages or Relevant Figures Appear |
|---|---|---|---|---|---|---|
| | 1 | 5726989 | | 1998-03-10 | DOKIC; Miroslav V. | |
| | 2 | 5923869 | | 1999-07-13 | KASHIWAGI; Yoshiichiro et al. | |
| | 3 | 6108485 | | 2000-08-22 | KIM; Jeong-Kyu | |
| | 4 | 6343028 | | 2002-01-29 | KUWAOKA; Toshiharu | |
| | 5 | 6687664 | | 2004-02-03 | SUSSMAN; Robert et al. | |
| | 6 | 6778493 | | 2004-08-17 | ISHII; Atsushi | |
| | 7 | 6970482 | | 2005-11-29 | KIM; Sung-Tae | |
| | 8 | 7130368 | | 2006-10-31 | AWEYA; James et al. | |

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|---|---|---|
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| | Filing Date | 04-17-2013 |
| | First Named Inventor | NICHOLAS; A. J. Millington |
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| | 1 | 20020114359 | | 2002-08-22 | IBARAKI; Susumu et al. | |
| | 2 | 20030035072 | | 2003-02-20 | HAGG; Wilhelm | |
| | 3 | 20030198254 | | 2003-10-23 | SULLIVAN; Gary E. et al. | |
| | 4 | 20030198255 | | 2003-10-23 | SULLIVAN; Gary E. et al. | |
| | 5 | 20030200001 | | 2003-10-23 | GODDARD; Mark D. | |
| | 6 | 20040248601 | | 2004-12-09 | CHANG; Chin-Chi | |
| | 7 | 20060098936 | | 2006-05-11 | IKEDA; Wataru et al. | |
| | 8 | 20070043847 | | 2007-02-22 | CARTER; Harry N. et al. | |
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|---|---|---|
| | Application Number | 13864248 |
| | Filing Date | 04-17-2013 |
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| | Art Unit | 2442 |
| | Examiner Name | SURVILLO, OLEG |
| | Attorney Docket Number | 13-0401 (MBHB 15-517-CON) |

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| | 10 | 20100299639 | | 2010-11-25 | RAMSAY; Max Gordon et al. | | |

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|---|---|---|---|
| | 1 | "Advisory Action mailed on 1 June 2015, issued in connection with U.S. Patent Application No. 14/516867, filed on 17 October 2014, 11 pages". | ☐ |
| | 2 | "Baldwin, Roberto. "How-To: Setup iTunes DJ on Your Max and iPhone", available at http://www.maclife.com/article/howtos/howto_setup_itunes_dj_your_mac_and_iphone, archived on 3/17/ 2009, 4 pages.". | ☐ |
| | 3 | "Final Office Action mailed on 15 June 2015, issued in connection with U.S. Patent Application No. 14/184522, filed on 19 February 2014, 25 pages". | ☐ |
| | 4 | "Non-Final Office Action mailed on 12 June 2015, issued in connection with U.S. Patent Application No. 13/848932, filed on 22 March 2013, 16 pages". | ☐ |
| | 5 | "Non-Final Office Action mailed on 19 June 2015, issued in connection with U.S. Patent Application No. 13/533105 filed on 26 June 2012, 38 pages.". | ☐ |

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|---|---|---|---|
| | 6 | "Non-Final Office Action mailed on 23 June 2015, issued in connection with U.S. Patent Application No. 13/705176, filed on 5 December 2012, 30 pages". | ☐ |
| | 7 | "Non-Final Office Action mailed on 3 June 2015, issued in connection with U.S. Patent Application No. 14/564544, filed on 9 December 2014, 7 pages.". | ☐ |
| | 8 | "Non-Final Office Action mailed on 4 June 2015, issued in connection with U.S. Patent Application No. 13/871795 filed on 26 April 2013, 16 pages.". | ☐ |
| | 9 | "Notice of Allowance mailed on 2 July 2015, issued in connection with U.S. Patent Application No. 13/848904, filed on 22 March 2013, 17 pages". | ☐ |
| | 10 | "Notice of Allowance mailed on 2 July 2015, issued in connection with U.S. Patent Application No. 13/888203, filed on 6 May 2013, 19 pages". | ☐ |
| | 11 | "Notice of Allowance mailed on 2 July 2015, issued in connection with U.S. Patent Application No. 14/184935, filed on 20 February 2014, 23 pages". | ☐ |
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| | Attorney Docket Number | 13-0401 (MBHB 15-517-CON) |

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☐ That each item of information contained in the information disclosure statement was first cited in any communication from a foreign patent office in a counterpart foreign application not more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(1).

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☒ A certification statement is not submitted herewith.

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A signature of the applicant or representative is required in accordance with CFR 1.33, 10.18. Please see CFR 1.4(d) for the form of the signature.

| Signature | /Benjamin M. Urban/ | Date (YYYY-MM-DD) | 2015-07-10 |
|---|---|---|---|
| Name/Print | Benjamin M. Urban | Registration Number | 71,591 |

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The information provided by you in this form will be subject to the following routine uses:

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2. A record from this system of records may be disclosed, as a routine use, in the course of presenting evidence to a court, magistrate, or administrative tribunal, including disclosures to opposing counsel in the course of settlement negotiations.

3. A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.

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7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (i.e., GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.

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| Electronic Acknowledgement Receipt | |
|---|---|
| **EFS ID:** | 22880149 |
| **Application Number:** | 13864248 |
| **International Application Number:** | |
| **Confirmation Number:** | 5095 |
| **Title of Invention:** | SYSTEM AND METHOD FOR SYNCHRONIZING OPERATIONS AMONG A PLURALITY OF INDEPENDENTLY CLOCKED DIGITAL DATA PROCESSING DEVICES |
| **First Named Inventor/Applicant Name:** | Nicholas A. J. Millington |
| **Customer Number:** | 107361 |
| **Filer:** | Benjamin Michael Urban |
| **Filer Authorized By:** | |
| **Attorney Docket Number:** | 13-0401 (MBHB 15-517-CON) |
| **Receipt Date:** | 10-JUL-2015 |
| **Filing Date:** | 17-APR-2013 |
| **Time Stamp:** | 18:41:14 |
| **Application Type:** | Utility under 35 USC 111(a) |

## Payment information:

| Submitted with Payment | no |
|---|---|

## File Listing:

| Document Number | Document Description | File Name | File Size(Bytes)/ Message Digest | Multi Part /.zip | Pages (if appl.) |
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| 1 | Information Disclosure Statement (IDS) Form (SB08) | 13-0401_MBHB15-517-CON_IDS.pdf | 708014<br>eaf45c24c7c8e3ab508206c9337c9a9b040e57c8 | no | 6 |
| **Warnings:** | | | | | |
| **Information:** | | | | | |

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| 2 | Non Patent Literature | 14516867_Advisory_Action_6-1-15.pdf | 616982<br>3050ba39fb3247f76c85a3bd34cf48d66e7055ba | no | 11 |
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| 3 | Non Patent Literature | Baldwin_2009_Reference.pdf | 903362<br>8422d4841e69a7c92fd17aabe0be48a687b08db3 | no | 4 |
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| 4 | Non Patent Literature | 14184522_Final_OA_6-15-15.pdf | 1039401<br>500960021d5c52b1643c0d46ae9b5bbbdbc1c826 | no | 25 |
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| 5 | Non Patent Literature | 13848932_Non-Final_OA_6-12-15.pdf | 513062<br>96ccb5337b8cafed96c91c39264e5f0b3513cd9e | no | 16 |
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| 6 | Non Patent Literature | 13533105_Non-Final_OA_6-19-15.pdf | 1289356<br>8300207d63e690baa8e42f54863f97e4466e1d30 | no | 38 |
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| 7 | Non Patent Literature | 13705176_Non-Final_OA_6-23-15.pdf | 1076722<br>bd20eb51ad8026f7b519b42758da06c87ba8ed3f | no | 30 |
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| 8 | Non Patent Literature | 14564544_Non-Final_OA_6-3-15.pdf | 275013<br>02d3b0eb2d284579abf30b84dd36b9ef841cf439 | no | 7 |
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| 9 | Non Patent Literature | 13871795_Non-Final_OA_6-4-15.pdf | 513966<br>d0e52ff11adeef9811795be56fba251f3b0d49d9 | no | 16 |
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| 10 | Non Patent Literature | 13848904_NOA_7-2-15.pdf | 715510<br>671c946de78fe21f82cd17aca6daeffae723af7c | no | 17 |
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| 11 | Non Patent Literature | 13888203_NOA_7-2-15.pdf | 788278<br>720041564c35623e97d0aa0250e19c5706d9580c | no | 19 |
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| **Information:** | | | | | |
| 12 | Non Patent Literature | 14184935_NOA_7-2-15.pdf | 903361<br>d3e7e726fc1250edd4c48065dc353fc04a6dc292 | no | 23 |
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| **Information:** | | | | | |
| 13 | Non Patent Literature | 13297000_NOA_7-6-15.pdf | 913287<br>ae1344298983a152e8108d05ce6a8da86526ce30 | no | 24 |
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**If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.**

**National Stage of an International Application under 35 U.S.C. 371**
**If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.**

**New International Application Filed with the USPTO as a Receiving Office**
**If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.**

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**INFORMATION DISCLOSURE STATEMENT BY APPLICANT**
**( Not for submission under 37 CFR 1.99)**

| | |
|---|---|
| Application Number | 13864248 |
| Filing Date | 04-17-2013 |
| First Named Inventor | NICHOLAS; A. J. Millington |
| Art Unit | 2442 |
| Examiner Name | SURVILLO, OLEG |
| Attorney Docket Number | 13-0401 (MBHB 15-517-CON) |

**U.S.PATENTS** Remove

| Examiner Initial* | Cite No | Patent Number | Kind Code[1] | Issue Date | Name of Patentee or Applicant of cited Document | Pages,Columns,Lines where Relevant Passages or Relevant Figures Appear |
|---|---|---|---|---|---|---|
| | 1 | 5761320 | | 1998-06-02 | FARINELLI; Robert et al. | |
| | 2 | 6535121 | | 2003-03-18 | MATHNEY; Richard K. et al. | |

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|---|---|---|---|---|---|---|
| | 1 | 20140181569 | | 2014-06-26 | MILLINGTON; Nicholas A.J. et al. | |

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| INFORMATION DISCLOSURE STATEMENT BY APPLICANT ( Not for submission under 37 CFR 1.99) | | |
|---|---|---|
| | Application Number | 13864248 |
| | Filing Date | 04-17-2013 |
| | First Named Inventor | NICHOLAS; A. J. Millington |
| | Art Unit | 2442 |
| | Examiner Name | SURVILLO, OLEG |
| | Attorney Docket Number | 13-0401 (MBHB 15-517-CON) |

| Examiner Initials* | Cite No | Include name of the author (in CAPITAL LETTERS), title of the article (when appropriate), title of the item (book, magazine, journal, serial, symposium, catalog, etc), date, pages(s), volume-issue number(s), publisher, city and/or country where published. | T[5] |
|---|---|---|---|
| | 1 | "European Extended Search Report for Application No. 14181454.1 mailed on 31 March 2015, 9 pages.". | ☐ |
| | 2 | "Final Office Action mailed on 28 April 2015, issued in connection with U.S. Patent Application No. 14/186850, filed on 21 February 2014, 20 pages". | ☐ |
| | 3 | "Notice of Allowance mailed on 19 May 2015, issued in connection with U.S. Patent Application No. 13/907666, filed on 31 May 2013, 7 pages". | ☐ |
| | 4 | "Re-Exam Non-Final Office Action mailed on 22 April 2015, issued in connection with U.S. Patent Application No. 90/013423, filed on 5 January 2015, 16 pages.". | ☐ |

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| Examiner Signature | | Date Considered | |
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*EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through a citation if not in conformance and not considered. Include copy of this form with next communication to applicant.

[1] See Kind Codes of USPTO Patent Documents at www.USPTO.GOV or MPEP 901.04. [2] Enter office that issued the document, by the two-letter code (WIPO Standard ST.3). [3] For Japanese patent documents, the indication of the year of the reign of the Emperor must precede the serial number of the patent document. [4] Kind of document by the appropriate symbols as indicated on the document under WIPO Standard ST.16 if possible. [5] Applicant is to place a check mark here if English language translation is attached.

| INFORMATION DISCLOSURE STATEMENT BY APPLICANT ( Not for submission under 37 CFR 1.99) | | |
|---|---|---|
| | Application Number | 13864248 |
| | Filing Date | 04-17-2013 |
| | First Named Inventor | NICHOLAS; A. J. Millington |
| | Art Unit | 2442 |
| | Examiner Name | SURVILLO, OLEG |
| | Attorney Docket Number | 13-0401 (MBHB 15-517-CON) |

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Please see 37 CFR 1.97 and 1.98 to make the appropriate selection(s):

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☐ See attached certification statement.

☐ The fee set forth in 37 CFR 1.17 (p) has been submitted herewith.

☒ A certification statement is not submitted herewith.

**SIGNATURE**

A signature of the applicant or representative is required in accordance with CFR 1.33, 10.18. Please see CFR 1.4(d) for the form of the signature.

| Signature | /Benjamin M. Urban/ | Date (YYYY-MM-DD) | 2015-05-29 |
|---|---|---|---|
| Name/Print | Benjamin M. Urban | Registration Number | 71,591 |

This collection of information is required by 37 CFR 1.97 and 1.98. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 1 hour to complete, including gathering, preparing and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

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6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).

7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (i.e., GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.

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# Electronic Acknowledgement Receipt

| | |
|---|---|
| **EFS ID:** | 22479300 |
| **Application Number:** | 13864248 |
| **International Application Number:** | |
| **Confirmation Number:** | 5095 |
| **Title of Invention:** | SYSTEM AND METHOD FOR SYNCHRONIZING OPERATIONS AMONG A PLURALITY OF INDEPENDENTLY CLOCKED DIGITAL DATA PROCESSING DEVICES |
| **First Named Inventor/Applicant Name:** | Nicholas A. J. Millington |
| **Customer Number:** | 107361 |
| **Filer:** | Benjamin Michael Urban |
| **Filer Authorized By:** | |
| **Attorney Docket Number:** | 13-0401 (MBHB 15-517-CON) |
| **Receipt Date:** | 31-MAY-2015 |
| **Filing Date:** | 17-APR-2013 |
| **Time Stamp:** | 15:48:46 |
| **Application Type:** | Utility under 35 USC 111(a) |

## Payment information:

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| Submitted with Payment | no |

## File Listing:

| Document Number | Document Description | File Name | File Size(Bytes)/ Message Digest | Multi Part /.zip | Pages (if appl.) |
|---|---|---|---|---|---|
| 1 | Information Disclosure Statement (IDS) Form (SB08) | 13-0401_MBHB15-517-CON_IDS.pdf | 707167<br>827056b40aea51b9c4043bd19a7992be0a7f6a08 | no | 4 |
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| **Information:** | | | | | |

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| 2 | Non Patent Literature | European_No_141814541_Extended_Search_Report.pdf | 391494<br>1106f6014f64d2cca986d44d5e77d1edb5813b56 | no | 9 |
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| 3 | Non Patent Literature | 14186850_Final_OA_4-28-15.PDF | 709014<br>d9e9dbd6b72a32d09fbed664a38c47e275cf7138 | no | 20 |
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| 4 | Non Patent Literature | 13907666_NOA_5-19-15.PDF | 407923<br>f502be4aefeae6f0c3ee493757b88ae48d95988a | no | 7 |
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| 5 | Non Patent Literature | 90013423_Non-Final_OA_4-22-15.pdf | 585475<br>687eca797422ef5378b7be99928d400300c018a1 | no | 16 |
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**INFORMATION DISCLOSURE STATEMENT BY APPLICANT**
**( Not for submission under 37 CFR 1.99)**

| | |
|---|---|
| Application Number | 13864248 |
| Filing Date | 04-17-2013 |
| First Named Inventor | NICHOLAS; A. J. Millington |
| Art Unit | 2442 |
| Examiner Name | SURVILLO, OLEG |
| Attorney Docket Number | 13-0401 (MBHB 15-517-CON) |

**U.S.PATENTS** Remove

| Examiner Initial* | Cite No | Patent Number | Kind Code[1] | Issue Date | Name of Patentee or Applicant of cited Document | Pages,Columns,Lines where Relevant Passages or Relevant Figures Appear |
|---|---|---|---|---|---|---|
| | 1 | 6816818 | | 2004-11-09 | WOLF; Michael Jaochim et al. | |

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| Examiner Initial* | Cite No | Publication Number | Kind Code[1] | Publication Date | Name of Patentee or Applicant of cited Document | Pages,Columns,Lines where Relevant Passages or Relevant Figures Appear |
|---|---|---|---|---|---|---|
| | 1 | 20030018797 | | 2003-01-23 | DUNNING; Ted E. et al. | |
| | 2 | 20030067437 | | 2003-04-10 | MCCLINTOCK; Dale Thomas et al. | |
| | 3 | 20040213230 | | 2004-10-28 | DOUSKALIS; William et al. | |
| | 4 | 20040228367 | | 2004-11-18 | MOSIG; Rudiger et al. | |
| | 5 | 20130018960 | | 2013-01-17 | KNYSZ; Matthew S. et al. | |

| INFORMATION DISCLOSURE STATEMENT BY APPLICANT ( Not for submission under 37 CFR 1.99) | | |
|---|---|---|
| | Application Number | 13864248 |
| | Filing Date | 04-17-2013 |
| | First Named Inventor | NICHOLAS; A. J. Millington |
| | Art Unit | 2442 |
| | Examiner Name | SURVILLO, OLEG |
| | Attorney Docket Number | 13-0401 (MBHB 15-517-CON) |

| | | | | | | |
|---|---|---|---|---|---|---|
| | 6 | 20040208158 | | 2004-10-21 | FELLMAN; Ronald D. et al. | |
| | 7 | 20020114354 | | 2002-08-22 | SINHA; Pranesh. et al. | |
| | 8 | 20020080783 | | 2002-06-27 | FUJIMORI; Junichi | |

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**FOREIGN PATENT DOCUMENTS** Remove

| Examiner Initial* | Cite No | Foreign Document Number[3] | Country Code[2] i | Kind Code[4] | Publication Date | Name of Patentee or Applicant of cited Document | Pages,Columns,Lines where Relevant Passages or Relevant Figures Appear | T[5] |
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|---|---|---|---|
| | 1 | "Advisory Action mailed on 25 March 2015, issued in connection with U.S. Patent Application No. 13/533105, filed 26 June 2012, 5 pages.". | ☐ |
| | 2 | "Final Office Action mailed on 26 March 2015, issued in connection with U.S. Patent Application No. 14/184528, filed on 19 February 2014, 18 pages". | ☐ |
| | 3 | "Final Office Action mailed on 4 March 2015, issued in connection with U.S. Patent Application No. 13/848904, filed on 22 March 2013, 16 pages.". | ☐ |

| INFORMATION DISCLOSURE STATEMENT BY APPLICANT ( Not for submission under 37 CFR 1.99) | | |
|---|---|---|
| | Application Number | 13864248 |
| | Filing Date | 04-17-2013 |
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| | Attorney Docket Number | 13-0401 (MBHB 15-517-CON) |

| | | | |
|---|---|---|---|
| | 4 | "Final Office Action mailed on 5 March 2015, issued in connection with U.S. Patent Application No. 13/888203, filed on 6 May 2013, 13 pages.". | ☐ |
| | 5 | "Final Office Action mailed on 9 March 2015, issued in connection with U.S. Patent Application No. 14/516867, filed on 17 October 2014, 14 pages.". | ☐ |
| | 6 | "Non-Final Office Action mailed on 12 March 2015, issued in connection with U.S. Patent Application No. 13/705174, filed 5 December 2012, 13 pages.". | ☐ |
| | 7 | "Non-Final Office Action mailed on 13 March 2015, issued in connection with U.S. Patent Application No. 13/705177, filed 5 December 2012, 15 pages.". | ☐ |
| | 8 | "Non-Final Office Action mailed on 27 March 2015, issued in connection with U.S. Patent Application No. 13/705178, filed 5 December 2012, 14 pages.". | ☐ |
| | 9 | "Non-Final Office Action mailed on 4 March 2015, issued in connection with U.S. Patent Application No. 13/435776, filed on 30 March 2012, 16 pages.". | ☐ |
| | 10 | "Pre-Interview First Office Action mailed on 10 March 2015, issued in connection with U.S. Patent Application No. 14/505027, filed on 2 October 2014, 4 pages.". | ☐ |
| | 11 | "Advisory Action mailed on 15 April 2015, issued in connection with U.S. Patent Application No. 14/184526, filed on 19 February 2014, 9 pages.". | ☐ |
| | 12 | "Advisory Action mailed on 15 April 2015, issued in connection with U.S. Patent Application No. 14/184935, filed on 20 February 2014, 9 pages.". | ☐ |

If you wish to add additional non-patent literature document citation information please click the Add button Add

**EXAMINER SIGNATURE**

| Examiner Signature | | Date Considered | |
|---|---|---|---|

*EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through a citation if not in conformance and not considered. Include copy of this form with next communication to applicant.

| INFORMATION DISCLOSURE STATEMENT BY APPLICANT ( Not for submission under 37 CFR 1.99) | | |
|---|---|---|
| | Application Number | 13864248 |
| | Filing Date | 04-17-2013 |
| | First Named Inventor | NICHOLAS; A. J. Millington |
| | Art Unit | 2442 |
| | Examiner Name | SURVILLO, OLEG |
| | Attorney Docket Number | 13-0401 (MBHB 15-517-CON) |

[1] See Kind Codes of USPTO Patent Documents at www.USPTO.GOV or MPEP 901.04. [2] Enter office that issued the document, by the two-letter code (WIPO Standard ST.3). [3] For Japanese patent documents, the indication of the year of the reign of the Emperor must precede the serial number of the patent document. [4] Kind of document by the appropriate symbols as indicated on the document under WIPO Standard ST.16 if possible. [5] Applicant is to place a check mark here if English language translation is attached.

| INFORMATION DISCLOSURE STATEMENT BY APPLICANT ( Not for submission under 37 CFR 1.99) | | |
|---|---|---|
| | Application Number | 13864248 |
| | Filing Date | 04-17-2013 |
| | First Named Inventor | NICHOLAS; A. J. Millington |
| | Art Unit | 2442 |
| | Examiner Name | SURVILLO, OLEG |
| | Attorney Docket Number | 13-0401 (MBHB 15-517-CON) |

**CERTIFICATION STATEMENT**

Please see 37 CFR 1.97 and 1.98 to make the appropriate selection(s):

☐ That each item of information contained in the information disclosure statement was first cited in any communication from a foreign patent office in a counterpart foreign application not more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(1).

**OR**

☐ That no item of information contained in the information disclosure statement was cited in a communication from a foreign patent office in a counterpart foreign application, and, to the knowledge of the person signing the certification after making reasonable inquiry, no item of information contained in the information disclosure statement was known to any individual designated in 37 CFR 1.56(c) more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(2).

☐ See attached certification statement.

☐ The fee set forth in 37 CFR 1.17 (p) has been submitted herewith.

☒ A certification statement is not submitted herewith.

**SIGNATURE**

A signature of the applicant or representative is required in accordance with CFR 1.33, 10.18. Please see CFR 1.4(d) for the form of the signature.

| Signature | /Benjamin M. Urban/ | Date (YYYY-MM-DD) | 2015-04-22 |
|---|---|---|---|
| Name/Print | Benjamin M. Urban | Registration Number | 71,591 |

This collection of information is required by 37 CFR 1.97 and 1.98. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 1 hour to complete, including gathering, preparing and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

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The Privacy Act of 1974 (P.L. 93-579) requires that you be given certain information in connection with your submission of the attached form related to a patent application or patent. Accordingly, pursuant to the requirements of the Act, please be advised that: (1) the general authority for the collection of this information is 35 U.S.C. 2(b)(2); (2) furnishing of the information solicited is voluntary; and (3) the principal purpose for which the information is used by the U.S. Patent and Trademark Office is to process and/or examine your submission related to a patent application or patent. If you do not furnish the requested information, the U.S. Patent and Trademark Office may not be able to process and/or examine your submission, which may result in termination of proceedings or abandonment of the application or expiration of the patent.

The information provided by you in this form will be subject to the following routine uses:

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2. A record from this system of records may be disclosed, as a routine use, in the course of presenting evidence to a court, magistrate, or administrative tribunal, including disclosures to opposing counsel in the course of settlement negotiations.

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4. A record in this system of records may be disclosed, as a routine use, to a contractor of the Agency having need for the information in order to perform a contract. Recipients of information shall be required to comply with the requirements of the Privacy Act of 1974, as amended, pursuant to 5 U.S.C. 552a(m).

5. A record related to an International Application filed under the Patent Cooperation Treaty in this system of records may be disclosed, as a routine use, to the International Bureau of the World Intellectual Property Organization, pursuant to the Patent Cooperation Treaty.

6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).

7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (i.e., GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.

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9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

# Electronic Acknowledgement Receipt

| | |
|---|---|
| **EFS ID:** | 22119880 |
| **Application Number:** | 13864248 |
| **International Application Number:** | |
| **Confirmation Number:** | 5095 |
| **Title of Invention:** | SYSTEM AND METHOD FOR SYNCHRONIZING OPERATIONS AMONG A PLURALITY OF INDEPENDENTLY CLOCKED DIGITAL DATA PROCESSING DEVICES |
| **First Named Inventor/Applicant Name:** | Nicholas A. J. Millington |
| **Customer Number:** | 107361 |
| **Filer:** | Benjamin Michael Urban |
| **Filer Authorized By:** | |
| **Attorney Docket Number:** | 13-0401 (MBHB 15-517-CON) |
| **Receipt Date:** | 21-APR-2015 |
| **Filing Date:** | 17-APR-2013 |
| **Time Stamp:** | 13:36:20 |
| **Application Type:** | Utility under 35 USC 111(a) |

## Payment information:

| | |
|---|---|
| Submitted with Payment | no |

## File Listing:

| Document Number | Document Description | File Name | File Size(Bytes)/ Message Digest | Multi Part /.zip | Pages (if appl.) |
|---|---|---|---|---|---|
| 1 | Information Disclosure Statement (IDS) Form (SB08) | 13-0401_MBHB15-517-CON_IDS.pdf | 707564<br>c4b945a380fe0899ea12f5791a5f9ee11128a717 | no | 6 |
| **Warnings:** | | | | | |
| **Information:** | | | | | |

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| 2 | Non Patent Literature | 13533105_Advisory_Action_3-25-15.pdf | 218958<br>006d28fd77d799a1965f257e8ae29ae2612d36da | no | 5 |
| **Warnings:** | | | | | |
| **Information:** | | | | | |
| 3 | Non Patent Literature | 14184528_Final_OA_3-26-15.pdf | 605225<br>4e9802b7b83c2080e92153f4a34e42bc21c96cb0 | no | 18 |
| **Warnings:** | | | | | |
| **Information:** | | | | | |
| 4 | Non Patent Literature | 13848904_Final_OA_3-4-15.pdf | 536474<br>5ab7b3c4b09c851e1d8dde8337b3ac29af7cf428 | no | 16 |
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| **Information:** | | | | | |
| 5 | Non Patent Literature | 13888203_Final_Rejection_3-5-15.pdf | 452379<br>ffb224c98f18d2cfebd30b2bfb3a74cedf3d80e4 | no | 13 |
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| **Information:** | | | | | |
| 6 | Non Patent Literature | 14516867_Final_OA_3-9-15.pdf | 493096<br>52c677d8704b8b74a1dffae4658c3a3c95632b6b | no | 14 |
| **Warnings:** | | | | | |
| **Information:** | | | | | |
| 7 | Non Patent Literature | 13705174_NonFinal_OA_3-12-15.pdf | 390533<br>fccb351de023e03317bf33631b8674c6943346cb | no | 13 |
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| **Information:** | | | | | |
| 8 | Non Patent Literature | 13705177_Non-Final_OA_3-13-15.pdf | 467012<br>57778be2fe6748e486536da62d73f48d35825a09 | no | 15 |
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| **Information:** | | | | | |
| 9 | Non Patent Literature | 13705178_Non-Final_OA_3-27-15.pdf | 431284<br>4a55c02cbf9c8eb4b7ec902d0d2473bda8535b46 | no | 14 |
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| **Information:** | | | | | |
| 10 | Non Patent Literature | 13435776_Non-Final_Rejection_3-4-15.pdf | 553426<br>c85dbfe1c8fe2d35e56f9d69126c9aa39c2ad2fc | no | 16 |
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| **Information:** | | | | | |

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| 11 | Non Patent Literature | 14505027_PreInterview_First_Office_Action_3-10-15.pdf | 142375<br>5fe5ce90bc3280cf6895c7304a55e5cd64c5b68d | no | 4 |
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| **Information:** | | | | | |
| 12 | Non Patent Literature | 14184526_Advisory_Action_4-15-15.pdf | 516346<br>45c64a0f8faf4858cf5eeff4a60bc3ed15387e29 | no | 9 |
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| **Information:** | | | | | |
| 13 | Non Patent Literature | 14184935_Advisory_Action_4-15-15.pdf | 525787<br>111a50b28ddfe78c3b04ab88356f0a02a26618cb | no | 9 |
| **Warnings:** | | | | | |
| **Information:** | | | | | |
| | | | **Total Files Size (in bytes):** | 6040459 | |

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**New Applications Under 35 U.S.C. 111**
**If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.**

**National Stage of an International Application under 35 U.S.C. 371**
**If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.**

**New International Application Filed with the USPTO as a Receiving Office**
**If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.**

UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

| APPLICATION NUMBER | FILING OR 371(C) DATE | FIRST NAMED APPLICANT | ATTY. DOCKET NO./TITLE |
|---|---|---|---|
| 13/864,248 | 04/17/2013 | Nicholas A. J. Millington | SNS-71301US10 (13-0401) |

**CONFIRMATION NO. 5095**

107361
McDonnell Boehnen Hulbert & Berghoff LLP
Sonos, Inc.
300 South Wacker Drive
Chicago, IL 60606

**POA ACCEPTANCE LETTER**

*OC000000074421453*

Date Mailed: 04/06/2015

## NOTICE OF ACCEPTANCE OF POWER OF ATTORNEY

This is in response to the Power of Attorney filed 04/01/2015.

The Power of Attorney in this application is accepted. Correspondence in this application will be mailed to the above address as provided by 37 CFR 1.33.

/qtran/

Office of Data Management, Application Assistance Unit (571) 272-4000, or (571) 272-4200, or 1-888-786-0101

UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

| APPLICATION NUMBER | FILING OR 371(C) DATE | FIRST NAMED APPLICANT | ATTY. DOCKET NO./TITLE |
|---|---|---|---|
| 13/864,248 | 04/17/2013 | Nicholas A. J. Millington | SNS-71301US10 (13-0401) |

**CONFIRMATION NO. 5095**

109473
Invention Mine LLC - SNS
200 S. Wacker Drive
Suite 3100
Chicago, IL 60606

**POWER OF ATTORNEY NOTICE**

*OC000000074421412*

Date Mailed: 04/06/2015

## NOTICE REGARDING CHANGE OF POWER OF ATTORNEY

This is in response to the Power of Attorney filed 04/01/2015.

- The Power of Attorney to you in this application has been revoked by the applicant. Future correspondence will be mailed to the new address of record(37 CFR 1.33).

/qtran/

Office of Data Management, Application Assistance Unit (571) 272-4000, or (571) 272-4200, or 1-888-786-0101

PTO/AIA/80 (07-12)
Approved for use through 11/30/2014. OMB 0651-0035
U.S. Patent and Trademark Office; U.S DEPARTMENT OF COMMERCE
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# POWER OF ATTORNEY TO PROSECUTE APPLICATIONS BEFORE THE USPTO

I hereby revoke all previous powers of attorney given in the application identified in the attached statement under 37 CFR 3.73(c).

I hereby appoint:

■ Practitioners associated with Customer Number: 107361

OR

☐ Practitioner(s) named below (if more than ten patent practitioners are to be named, then a customer number must be used):

| Name | Registration Number | Name | Registration Number |
|---|---|---|---|
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |

As attorney(s) or agent(s) to represent the undersigned before the United States Patent and Trademark Office (USPTO) in connection with any and all patent applications assigned only to the undersigned according to the USPTO assignment records or assignments documents attached to this form in accordance with 37 CFR 3.73(c).

Please change the correspondence address for the application identified in the attached statement under 37 CFR 3.73(c) to:

■ The address associated with Customer Number: 107361

OR

☐

| | | | |
|---|---|---|---|
| Firm or Individual Name | | | |
| Address | | | |
| City | | State | Zip |
| Country | | | |
| Telephone | | Email | |

Assignee Name and Address: Sonos, Inc, 223 E. De La Guerra St.
Santa Barbara, CA 93101

**A copy of this form, together with a statement under 37 CFR 3.73(c) (Form PTO/AIA/96 or equivalent) is required to be filed in each application in which this form is used. The statement under 37 CFR 3.73(c) may be completed by one of The practitioners appointed in this form, and must identify the application in which this Power of Attorney is to be filed.**

**SIGNATURE of Assignee of Record**

The individual whose signature and title is supplied below is authorized to act on behalf of the assignee

| | | | |
|---|---|---|---|
| Signature | [signature] | Date | 10/2/2012 |
| Name | Mark Triplett | Telephone | (805) 965-3001 |
| Title | Director, IP | | |

This collection of information is required by 37 CFR 1.31, 1.32 and 1.33. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.11 and 1.14. This collection is estimated to take 3 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

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# Electronic Acknowledgement Receipt

| | |
|---|---|
| **EFS ID:** | 21912150 |
| **Application Number:** | 13864248 |
| **International Application Number:** | |
| **Confirmation Number:** | 5095 |
| **Title of Invention:** | SYSTEM AND METHOD FOR SYNCHRONIZING OPERATIONS AMONG A PLURALITY OF INDEPENDENTLY CLOCKED DIGITAL DATA PROCESSING DEVICES |
| **First Named Inventor/Applicant Name:** | Nicholas A. J. Millington |
| **Customer Number:** | 109473 |
| **Filer:** | Jeffrey Armstrong |
| **Filer Authorized By:** | |
| **Attorney Docket Number:** | SNS-71301US10 (13-0401) |
| **Receipt Date:** | 01-APR-2015 |
| **Filing Date:** | 17-APR-2013 |
| **Time Stamp:** | 09:57:43 |
| **Application Type:** | Utility under 35 USC 111(a) |

## Payment information:

| | |
|---|---|
| Submitted with Payment | no |

## File Listing:

| Document Number | Document Description | File Name | File Size(Bytes)/ Message Digest | Multi Part /.zip | Pages (if appl.) |
|---|---|---|---|---|---|
| 1 | Power of Attorney | SonosPOA.pdf | 59137<br>ad1d213683cc4019bf26d10570655bcd3505f7f0 | no | 1 |
| **Warnings:** | | | | | |
| **Information:** | | | | | |

| Total Files Size (in bytes): | 59137 |
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**New Applications Under 35 U.S.C. 111**
**If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.**

**National Stage of an International Application under 35 U.S.C. 371**
**If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.**

**New International Application Filed with the USPTO as a Receiving Office**
**If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.**

PTO/SB/08a (01-10)
Approved for use through 07/31/2012. OMB 0651-0031
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE

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**INFORMATION DISCLOSURE STATEMENT BY APPLICANT**
**( Not for submission under 37 CFR 1.99)**

| | |
|---|---|
| Application Number | 13864248 |
| Filing Date | 2013-04-17 |
| First Named Inventor | MILLINGTON, NICHOLAS A. J. |
| Art Unit | 2442 |
| Examiner Name | SURVILLO, OLEG |
| Attorney Docket Number | SNS-71301US10 (13-0401) |

**U.S.PATENTS** Remove

| Examiner Initial* | Cite No | Patent Number | Kind Code[1] | Issue Date | Name of Patentee or Applicant of cited Document | Pages,Columns,Lines where Relevant Passages or Relevant Figures Appear |
|---|---|---|---|---|---|---|
| | 1 | 5153579 | | 1992-10-06 | FISCH; Kenneth D. et al. | |
| | 2 | 7206967 | | 2007-04-17 | MARTI; Philippe et al. | |
| | 3 | 7711774 | | 2010-05-04 | ROTHSCHILD; Leigh M. | |

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|---|---|---|---|---|---|---|
| | 1 | 20010046235 | | 2001-11-29 | TREVITT; Stephen et al. | |
| | 2 | 20020173273 | | 2002-11-21 | SPURGAT; Jeffrey Jonathan et al. | |
| | 3 | 20040098754 | | 2004-05-20 | VELLA; Zane et al. | |

| INFORMATION DISCLOSURE STATEMENT BY APPLICANT ( Not for submission under 37 CFR 1.99) | | |
|---|---|---|
| | Application Number | 13864248 |
| | Filing Date | 2013-04-17 |
| | First Named Inventor | MILLINGTON, NICHOLAS A. J. |
| | Art Unit | 2442 |
| | Examiner Name | SURVILLO, OLEG |
| | Attorney Docket Number | SNS-71301US10 (13-0401) |

| | | | | | | |
|---|---|---|---|---|---|---|
| | 4 | 20050062637 | | 2005-03-24 | EL; Zabadani Hicham Mahmoud et al. | |
| | 5 | 20130022221 | | 2013-01-24 | KALLAI; Christopher et al. | |

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|---|---|---|---|---|---|---|---|---|
| | 1 | 2338374 | GB | | 1999-12-15 | MOTOROLA LTD. | | ☐ |
| | 2 | 07-210129 | JP | | 1995-08-11 | INTERNAT'L BUSINESS MACH CORP (IBM) | | ☐ |
| | 3 | 2005108427 | JP | | 2005-04-21 | RICOH KK. | | ☐ |

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|---|---|---|---|
| | 1 | "Advisory Action mailed on 2 March 2015, issued in connection with U.S. Patent Application No. 13/848932, filed on March 22, 2013, 3 pages.". | ☐ |
| | 2 | "Advisory Action mailed on 26 February 2015, issued in connection with U.S. Patent Application No. 14/184,528, filed on 19 February 2014, 3 pages.". | ☐ |

| INFORMATION DISCLOSURE STATEMENT BY APPLICANT ( Not for submission under 37 CFR 1.99) | | |
|---|---|---|
| | Application Number | 13864248 |
| | Filing Date | 2013-04-17 |
| | First Named Inventor | MILLINGTON, NICHOLAS A. J. |
| | Art Unit | 2442 |
| | Examiner Name | SURVILLO, OLEG |
| | Attorney Docket Number | SNS-71301US10 (13-0401) |

| | | | |
|---|---|---|---|
| | 3 | "Final Office Action mailed on 11 February 2015, issued in connection with U.S. Patent Application No. 14/184526, filed on 19 February 2014, 13 pages". | ☐ |
| | 4 | "Final Office Action mailed on 11 February 2015, issued in connection with U.S. Patent Application No. 14/184,935, filed on 20 February 2014, 17 pages". | ☐ |
| | 5 | "Final Office Action mailed on 12 February 2015, issued in connection with U.S. Patent Application No. 14/184522, filed on 19 February 2014, 20 pages". | ☐ |
| | 6 | "INTERNATIONAL BUREAU,"International Preliminary Report on Patentability" issued in connection with International Patent application No. PCT/US2013/046372, mailed December 31, 2014, 5 pages.". | ☐ |
| | 7 | "International Preliminary Report on Patentability and Written Opinion, issued by the International Searching Authority in connection with International Patent Application No. PCT/US2013/046386, mailed on January 8, 2015, 8 pages". | ☐ |
| | 8 | "Non-Final Office Action mailed on 26 February 2015, issued in connection with U.S. Patent Application No. 14/186,850, filed on 21 February 2014, 25 pages.". | ☐ |
| | 9 | "Non-Final Office Action mailed on 30 January 2015, issued in connection with U.S. Patent Application No. 14/504,812, filed on 2 October 2014, 13 pages". | ☐ |
| | 10 | "Non-Final Office Action mailed on 30 January 2015, issued in connection with U.S. Patent Application No. 14/290,493, filed on 29 May 2014, 29 pages.". | ☐ |
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|---|---|---|
| | Application Number | 13864248 |
| | Filing Date | 2013-04-17 |
| | First Named Inventor | MILLINGTON, NICHOLAS A. J. |
| | Art Unit | 2442 |
| | Examiner Name | SURVILLO, OLEG |
| | Attorney Docket Number | SNS-71301US10 (13-0401) |

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| | Art Unit | 2442 |
| | Examiner Name | SURVILLO, OLEG |
| | Attorney Docket Number | SNS-71301US10 (13-0401) |

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☐ The fee set forth in 37 CFR 1.17 (p) has been submitted herewith.

☒ A certification statement is not submitted herewith.

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A signature of the applicant or representative is required in accordance with CFR 1.33, 10.18. Please see CFR 1.4(d) for the form of the signature.

| Signature | /Robert J. Irvine III/ | Date (YYYY-MM-DD) | 2015-03-20 |
|---|---|---|---|
| Name/Print | Robert J. Irvine III | Registration Number | 41865 |

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| **EFS ID:** | 21837489 |
| **Application Number:** | 13864248 |
| **International Application Number:** | |
| **Confirmation Number:** | 5095 |
| **Title of Invention:** | SYSTEM AND METHOD FOR SYNCHRONIZING OPERATIONS AMONG A PLURALITY OF INDEPENDENTLY CLOCKED DIGITAL DATA PROCESSING DEVICES |
| **First Named Inventor/Applicant Name:** | Nicholas A. J. Millington |
| **Customer Number:** | 109473 |
| **Filer:** | Robert Johnson Irvine |
| **Filer Authorized By:** | |
| **Attorney Docket Number:** | SNS-71301US10 (13-0401) |
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| 1 | Foreign Reference | GB2338374.pdf | 570090<br>3f631e460ac8630289b34fec71d695ffa1250fe1 | no | 16 |

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| 2 | Foreign Reference | JP07210129.pdf | 1047465<br>c0f7b2f5445519535515cb21b06d7dca1b83a6b7 | no | 13 |
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| 3 | Foreign Reference | JP2005108427_Combined_flattened.pdf | 1974366<br>99b3b0640d2fbae2bddc91bb971e0d4f84930974 | no | 23 |
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| 4 | Non Patent Literature | 13848932_Advisory_Action_3-2-15.pdf | 129403<br>4e86cb3cfe17cb7328f5d3ff64a102cf3d0c9c41 | no | 3 |
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| 5 | Non Patent Literature | 14184528_Advisory_Action_2-26-15.pdf | 124587<br>e77e42d136a5952f36322b77909680f5060eb3ff | no | 3 |
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| 6 | Non Patent Literature | 14184526_Final_OA_2-11-15.pdf | 444504<br>4d2ca224f13835ab971c56f83091a5b9dc090bca | no | 13 |
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| 7 | Non Patent Literature | 14184935_Final_OA_2-11-15.pdf | 597904<br>06df6bf664b3ebc72f1e54a3a57394b1c15d22d3 | no | 17 |
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| 10 | Non Patent Literature | PCTUS2013046386_Intl_Preliminary_Report_1-8-15.pdf | 308278<br>d483d48dbb01747b5d9fb4710b31c32aadf7ba53 | no | 8 |
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| 13 | Non Patent Literature | 14290493_NonFinal_OA_1-30-15.pdf | 979980<br>474204afb3d454e359995b393fdb69f335e07ba3 | no | 29 |
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| 14 | Non Patent Literature | 13864251_Final_OA_3-3-15.pdf | 454610<br>2c7c737ae1fd3642d55b1c7d1545fc7b3c7626d3 | no | 13 |
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| 15 | Information Disclosure Statement (IDS) Form (SB08) | SNS-71301US10-13-0401-SupplDS-MAR2015pdf.pdf | 707644<br>f5279c424a7d10a68711256424665ee182c675b2 | no | 6 |
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(12) UK Patent Application (19) GB (11) 2 338 374 (13) A

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(51) INT CL$^6$
**G01S 5/06 , H04Q 7/38**

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**H4L** LDSL L1H10
**H4D** DPAB D512 D536 D568 D576 D580 D584 D585

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| | | |
|---|---|---|
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| EP 0733912 A2 | EP 0385600 A2 | US 5327144 A |
| US 5317323 A | US 4916455 A | US 4698781 A |

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UK CL (Edition P ) **H4D DPAB , H4L LDSL**
INT CL$^6$ **G01S 5/00 5/06 , H04Q 7/38**
**ONLINE: WPI**

(54) Abstract Title
**Locating a mobile telephone using time of arrival measurements**

(57) Apparatus and method for determining the location of a subscriber unit 1 in a mobile telecommunications network and particularly in a GSM cellular network, includes the provision of several receiver or "slave" stations 4, 5, 6, controlled by a "master" base transceiver station 2 and positioned at separate known locations within each cell. Each of the receiver slave stations 4, 5, 6, which are synchronised by means of an on-board GPS receiver clock (10 fig. 2), measures the time of arrival of a signal (e.g. fill frame) transmitted from the subscriber unit 1. The time of arrival measurements recorded by each "slave" station 4, 5, 6 are then transmitted (e.g. via SMS, GPRS or USSD) to a computation device 3 for computation of the subscriber unit's 1 location relative to the "slave" stations 4, 5, 6. The computation device 3 may be provided at the "master" station. In operation, the "master" station may on reception of a location request from the subscriber unit 1 or network, perform a rough estimate of the location of the unit 1 using GSM data (e.g. power measurement, timing advance data etc), decide which "slave" stations 4, 5, 6 to use in the location determination and then instruct the "slave" stations to start receiving signals and the subscriber unit 1 to transmit a signal burst. Power and signal quality estimates may be provided along with time of arrival and spatial or polarisation diversity techniques may be used to improve sensitivity,(e.g. reception of two successive signal bursts on different antennas at the slave stations).

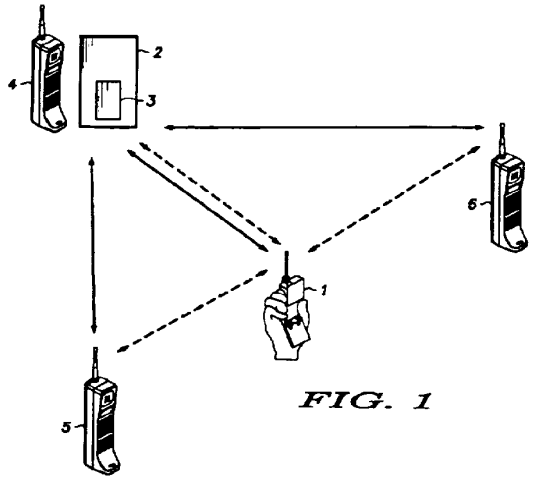



FIG. 1

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

GB 2 338 374 A

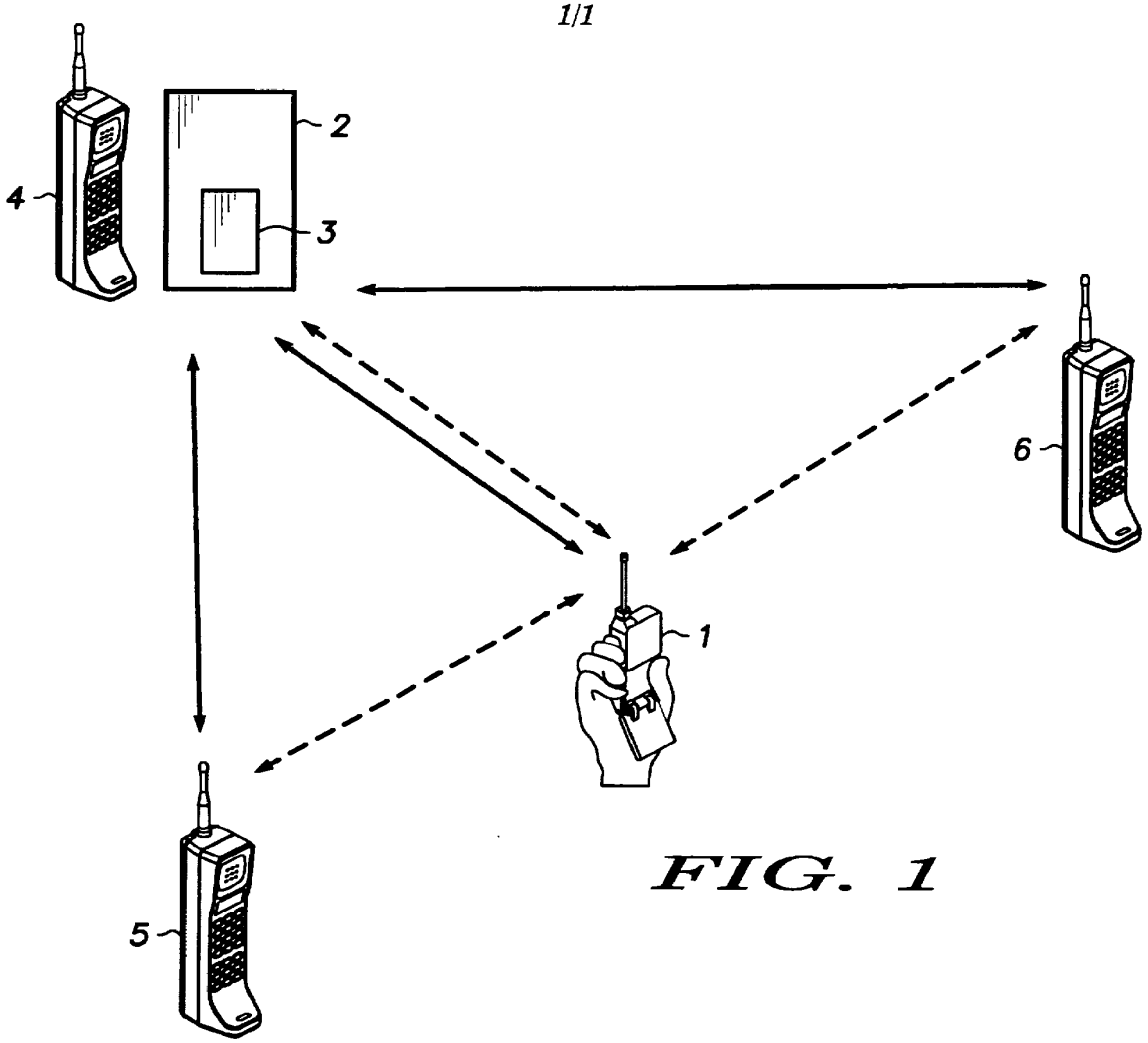

2
3
4
5
6
1

FIG. 1

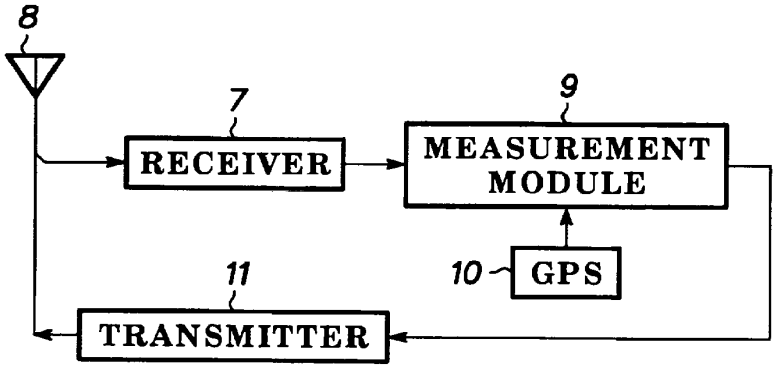

8
7
RECEIVER
9
MEASUREMENT MODULE
10
GPS
11
TRANSMITTER

FIG. 2

# LOCATION APPARATUS AND METHOD IN A MOBILE TELECOMMUNICATIONS SYSTEM

This invention relates to determining location in mobile communication systems and particularly though not exclusively, to the cellular GSM system (Global System for Mobile Communications), a description of which can be found in the book "The GSM System for Mobile Communications" by M. Mouley and M. Pautet.

A cellular radio telephone radio system generally includes a switch controller coupled to the public switched telephone network (PSTN) and a plurality of base stations. Each of the plurality of base stations generally defines a geographic region or "cell" proximate to the base station to produce coverage areas. One or more mobile stations communicate with a base station that facilitates a call between the mobile station and the PSTN. The communication link over a carrier signal from the base station to a mobile station is referred to as the downlink. Conversely, the communication link from a mobile station to the base station is referred to as the uplink.

GSM networks are made up of mobile services switching centres, base station systems and mobile stations. These three entities can be broken down further into smaller entities such as within the base station system there are base station controllers, base transceiver stations and transcoders.

It may be advantageous to determine the location of a mobile station. For example, such information would be useful to emergency, tariffing services and traffic routing services. The accuracy required is dictated by the service for which location determination is needed. For example, for tariffing, an accuracy of 500 metres might be acceptable. However, for the purpose of locating the nearest restaurant, for example, an accuracy of less than 100 metres would be needed. The initial driving force for location

determination was the legislation brought out in the United States of America (known as E911) which requires that a mobile station can be located to within 125 metres for 67% of the time for the emergency services. This is to be introduced in stages and is expected to be operational by the year 2001. At present, in countries operating GSM networks there is no such legislation in place. However, the need for location determination in GSM systems is gaining momentum with a plethora of services being anticipated and also location-selective tariffing being proposed.

Most known methods of locating a mobile station in a mobile telecommunications network involve a calculation of the distances between three or more base stations and mobile stations. One known method of estimating the distance between a base station and a mobile station in a GSM network involves measuring the propagation delay incurred by the carrier signal during its return trip from the base station to a mobile station. (See for example, WO-A-9205672). Once the distance between three or more known fixed points and the mobile stations are known, the mobile station's relative position can be calculated. For example, the so-called "circle method" described in WO-A-9205672 is based on measurements of three independent distances. With three given known reference points in a plane, it is possible to establish the co-ordinates of any other point in the same plane using the distances between the reference points and the point in question.

Location of a mobile station by using the known technique based on measurements of propagation delay require that the mobile station is simultaneously visible to at least three base stations. Environmental constraints on the cellular network may not always make this possible.

The present invention seeks to remove this constraint.

In one aspect, the present invention consists of apparatus for determining the location of a mobile station in a mobile telecommunications system, the apparatus comprising:

a computation device,
a master station, and
a plurality of slave stations positioned at known locations,

in which the master station incorporates a transmitter and a receiver for communicating with the mobile station and with the plurality of slave stations,

and in which each slave station incorporates a clock, a receiver for receiving signals from the mobile station, measuring means for measuring the time of arrival of the signals, and a transmitter for facilitating transmission of the time of arrival measurements to the computation device for calculating the location of the mobile station.

The computation device may be located at the master station or at some other remote location. Time of arrival measurements may be transmitted directly to such a remote location or via the master station.

The master station may, in part, comprise a conventional base transceiver station fitted with additional components in accordance with the invention.

The slave stations may comprise a modified form of radio telecommunication handset and may, conveniently, be mounted at the top of lamp posts, for example.

The clock required by each slave station could comprise part of a commercially available GPS receiver (Global Positioning System).

Hence the invention advantageously requires only relatively inexpensive equipment additional to the mobile telecommunication infrastructure. Each base transceiver station in the network would preferably control a minimum of three slave stations (in order to give a reasonably accurate fix on the location of the mobile station) within the cell it serves. Conveniently, one could be co-located with the master station. The slave stations need only be small and can be mounted almost anywhere, preferably at a site with an electrical power supply. They could, of course, be powered by battery or solar cells. Another advantage is that they do not require a dedicated leased telecommunications line.

The invention provides the further advantage in that only one transceiver station needs to be used in the location process. Therefore, in large cells where there may be no or very weak signals from neighbouring base transceivers stations, location estimates can still be performed.

Further, by virtue of this invention, location determination by time of arrival measurements does not require time synchronisation of the entire telecommunications network. This would otherwise have to be done by the additional, complicated method of using a common clock, or establishing a reference station which calculates the time offsets between different components of the network. Using this invention, it is sufficient for just the slave stations peculiar to a cell to be synchronised.

The signals sent by the mobile station to the slave stations can be kept very simple in content, i.e. no large amount of data needs to be transmitted over the network. The signals may comprise conventional "fill-frames" for example.

Further, the data generated by the slave stations e.g. time of arrival measurements can be transmitted in SMS format (short message service), GPRS or USSD. This latter facet enables multiple measurements to be

made in order to improve the accuracy of the location computation without putting a prohibitive load on the network.

Hence the location apparatus of the present invention can be "overlaid" on an existing radio communications network and be invisible to it.

Initial control commands may originate from the master station (i.e. a serving base transceiver station in one particular embodiment) or the location procedure can be initiated either by the mobile station or by the controlling network components. (For example, a mobile switching centre).

The apparatus can be extended in the cellular network context so that any slave station can be used by any base transceiver station within range.

In a second aspect, the invention consists of a method for determining the location of a mobile station in a mobile telecommunication system, the method including the steps of:

receiving at a plurality of time-synchronised slave station, control signals from a master station,

receiving at each of the slave stations signals from the mobile station,

measuring at each of the slave stations the time of arrival of the signals, from the mobile station.

transmitting from each of the slave stations the time of arrival measurements to a computation device,

and computing in the computation device the location of the mobile station with respect to the slave stations according to the time of arrival measurements.

The method may further comprise the step, in the master station, of receiving a location request from either the mobile station or from a controlling element of the telecommunications network.

In a preferred embodiment, the master station designates particular slave stations for receiving signals from the mobile station and for performing the time of arrival measurements. It may also instruct the mobile station when, at a particular moment in time, to transmit a signal burst.

Some embodiments of the invention will now be described by way of example only, with reference to the drawings of which;

Figure 1 is a schematic diagram of location apparatus in accordance with the invention and incorporated in a GSM cellular network,

and Figure 2 is a schematic block diagram of the components of a slave station of Figure 1.

Referring then to Figure 1, a mobile station 1 is located in a cell served by a base transceiver station (BTS) 2. The BTS 2 incorporates a computation device 3. Co-located with the BTS 2 and powered therefrom is a first slave station 4. Two additional slave stations 5 and 6 are located within the cell and are remote from the BTS 2. Other slave stations may also be located in the cell but only two remote stations are shown here for clarity. Each slave station 4, 5, 6 comprises a modified handset.

The locations of the BTS 2 and all three slave station 4, 5, 6 are known. The location of the mobile station 1 is initially not known at all.

Communications links exist between mobile station 1 and the BTS 2 (on an uplink and a downlink), between the BTS 2 and the slave stations 4, 5, 6 (on

an uplink and a downlink) and between the mobile station 1 and the slave stations 4, 5, 6 (on an uplink only).

With reference to Figure 2, each slave station includes the following components. A receiver 7 connected to an antenna 8 receives signals from the mobile station 1. The output of the receiver 7 is fed to a first input of a measurement module 9. A second input of the measurement module is connected to the clock output of a conventional GPS receiver 10 for time synchronisation of each slave station.

The measurement module 9 performs time of arrival measurements on signals received from the mobile station 1 and feeds the measured values to a transmitter 11 for onward transmission via the antenna 8 to the computation device 3 in the BTS 2.

The BTS 2 and the mobile station 1 comprise, for the most part, conventional commercial equipment and function in the conventional manner in addition to facilitating the location operation.

The location apparatus of Figures 1 and 2 operates as follows.

The mobile station 1 (or alternatively the GSM network) initiates a location request to the BTS 2. The BTS 2 firstly on reception of the location request either directly or via the GSM network, performs a rough estimate of the position of the mobile station 1 by using data generic to the GSM system. Such data could include power measurement data, timing advance data, sector data, etc.

The BTS 2 then decides which slave stations are to be used in the location estimate. In this example, slave stations 4, 5 and 6 are to be used. The BTS 2 then checks the GPS clock 10 of the co-located slave station 4 and calculates a time for the designated slave stations to start receiving signals

from the mobile station 1. This time can be roughly synchronised with the GSM frame structure, timing advance, etc.

BTS 2 then contacts the relevant slave stations 4, 5, 6 via paging or SMS signal, to inform them of the start time of the receiving and measurement process, the frequency the mobile station 1 will transmit on and the GSM time slot. Optionally, each slave station 4, 5, 6 can confirm to the BTS that this message has arrived correctly.

The BTS 2 then instructs the mobile station 1 to transmit a signal burst. The slave stations now have knowledge of the frequency and timing parameters relating to this signal burst and are therefore able to measure time of arrival at the measurement module 9. As all slave stations are synchronised via the GPS receiver clock, the time of arrival measurements will be relatively accurate.

The slave stations 4, 5, 6 then each transmit their time of arrival measurements to the computation device 3 in the BTS 2 via an SMS message. Optionally, the slave stations 4, 5, 6 also transmit to the BTS 2 signal power estimate and signal quality estimate to assist in predicting the accuracy of the computed location of the mobile station 1.

The computation device 3 then calculates the mobile stations location (relative to the slave stations 4, 5, 6) by any one of several known methods, e.g. the aforementioned circle method.

As one of the slave stations 4 is co-located with the BTS 2, the BTS location can be used in the location calculation.

Finally, the BTS 2 transmits the computed location information to the network service provider via a mobile switching centre for example.

In an alternative embodiment, the computation device 3 is not located at the BTS 2 but at some other remote location. In this case the BTS 2 forwards the time of arrival measurement on to this remote location.

Location apparatus in accordance with this invention is less susceptible to interference than systems which rely on downlink measurements. This is because downlink measurements systems rely on receiving signals which originate well outside the serving cell.

The sensitivity of the invention may be improved by employing spatial or polarisation diversity techniques. E.g. by receiving and measuring two successive location signal bursts from the mobile station on different antennas incorporated in the slave stations.

## CLAIMS

1. Apparatus for determining the location of a mobile station in a mobile telecommunications system, the apparatus comprising:

A computation device;
A master station, and
a plurality of slave stations positioned at known locations;

in which the master station incorporates a transmitter and a receiver for communicating with the mobile station and with the plurality of slave stations, and in which each slave station incorporates a clock, a receiver for receiving signals from the mobile station, measuring means for measuring the time of arrival of the signals and a transmitter for facilitating transmission of the time of arrival measurements to the computation device for calculating the location of the mobile station.

2. Apparatus as claimed in Claim 1 in which the master station includes a processor for performing an estimate of the location of the mobile station and for determining which slave stations to communicate with.

3. Apparatus as claimed in Claim 2 in which the processor is configured to generate transmission instructions to the mobile station.

4. A method for determining the location of a mobile station in a mobile telecommunications system, a method including the steps of:

receiving at a plurality of time-synchronised slave stations, control signals from a master station;

receiving at each of the slave stations, signals from the mobile station;

measuring at each of the slave stations, the time of arrival of the signals from the mobile station;

transmitting from each of the slave stations, the time of arrival measurements to a computation device;

and computing in the computation device, the location of the mobile station with respect to the slave stations according to the time of arrival measurements.

5. A method as claimed in Claim 4 and further comprising the step of:

in the master station receiving a location request from the mobile station.

6. A method as claimed in either of Claims 4 or 5 and further including the step of in the master station performing an estimate of the location of the mobile station and designating particular slave stations for receiving signals from the mobile station and for performing time of arrival measurements.

7. A method as claimed in any of Claims 4 to 6 and further including the step of in the master station instructing the mobile station when to transmit signals to the slave stations.

8. A method as claimed in claim 6 and including the further step of at each slave station transmitting a message to the master station confirming receipt of the destination message.

9. Apparatus for determining the location of a mobile station in a mobile telecommunications system substantially as hereinbefore described with reference to the drawings.

10. A method for determining the location of a mobile station in as mobile telecommunications system substantially hereinbefore described with reference to the drawings.

The Patent Office

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INVESTOR IN PEOPLE

**Application No:** GB 9812404.3 **Examiner:** Anita Keogh
**Claims searched:** 1-8 **Date of search:** 1 December 1998

## Patents Act 1977
## Search Report under Section 17

**Databases searched:**

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

UK Cl (Ed.P): H4D (DPAB), H4L (LDSL)

Int Cl (Ed.6): G01S (5/00, 5/06), H04Q (7/38)

Other: Online: WPI

**Documents considered to be relevant:**

| Category | Identity of document and relevant passage | | Relevant to claims |
|---|---|---|---|
| X,Y | GB 2316823 A | (MOTOROLA) see whole document, especially page 2 line 24 to page 3 line 2 and figure 1. | X: 4<br>Y: 1 |
| X,Y | GB 2310098 A | (WESBY) see whole document, especially page 4 line 1 to page 5 line 7 and page 6 lines 23-30 | X: 4<br>Y: 1 |
| X,Y | GB 2250154 A | (ROKE MANOR) see whole document especially page 19 line 23-page 22 line 15 | X: 4<br>Y:1 |
| X | EP 0733912 A2 | (GEC) see whole document especially column 4 line 19 to column 5 line 37 | 1, 4, 7 |
| X,Y | EP 0385600 A2 | (ISC CARDION) see whole document | X: 4<br>Y: 1 |
| X | US 5327144 | (STILP et al.) See whole document, especially claim 1 | 4 |
| X,Y | US 5317323 | (KENNEDY et al.) See whole document especially col. 2 line 65 to col. 5 line 29 | X: 4<br>Y: 1 |
| X | US 4916455 | (BENT et al.) See whole document, especially column 4 lines 9-41 | 4 |

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|---|---|---|---|
| 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. |

The Patent Office

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INVESTOR IN PEOPLE

**Application No:** GB 9812404.3 **Examiner:** Anita Keogh
**Claims searched:** 1-8 **Date of search:** 1 December 1998

| Category | Identity of document and relevant passage | Relevant to claims |
|---|---|---|
| Y | US 4698781 (COCKERELL) see whole document | 1 |

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|---|---|---|---|
| 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. |

# PATENT ABSTRACTS OF JAPAN

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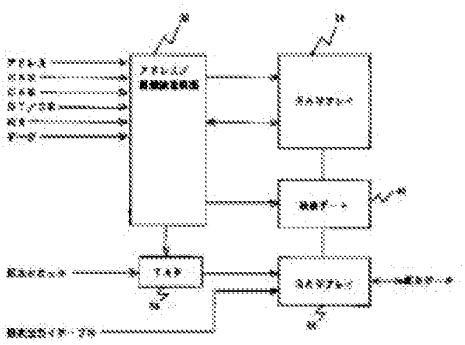
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(71)Applicant : INTERNATL BUSINESS MACH CORP <IBM>
(72)Inventor : BATES MATTHEW D
WEST RODERICK M P

(30)Priority
Priority number : 93 175874 Priority date : 30.12.1993 Priority country : US

## (54) SELF-TIMING TYPE REAL-TIME DATA TRANSFER FOR VIDEO RAM

(57)Abstract:
PURPOSE: To easily and efficiently eliminate the need of a complicated high- speed circuit from a VRAM base memory subsystem for making real-time data transfer.
CONSTITUTION: A video RAM semiconductor memory device is constituted of a RAM array 10 having address inputs for inputting row addresses, column addresses, and target addresses and a sequential access array 20 having a sequential output port. The video RAM is provided with an address/control logic circuit 30 which detects stimulation, such as the RAS clock, indicating the rough timing for data transfer between the arrays 10 and 20 from an external controller. The circuit 30 supplies a control signal which is internally synchronized to a sequential clock and the control signal is generated during the period during which the value of a tap point is equal to a value which is smaller than a target programmable value or input target address by '1'. Therefore, the row in the array 10 corresponding to an input row address is transferred between the arrays 10 and 20.



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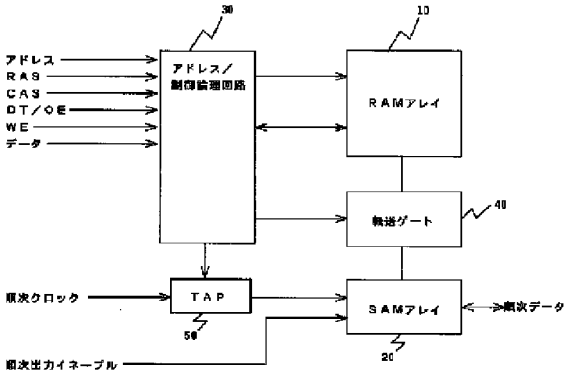
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(54)【発明の名称】　ビデオＲＡＭにおける自己タイミング式リアルタイム・データ転送

(57)【要約】

【目的】　ＶＲＡＭベース・メモリ・サブシステムに使用されるリアルタイム・データ転送に関連する複雑で高速な回路の必要を簡単かつ効率的に除去すること。

【構成】　ビデオＲＡＭ半導体メモリ・デバイスが、行アドレス、列アドレスおよび目標アドレスを入力するためのアドレス入力を有するＲＡＭアレイと、順次出力ポートを有する順次アクセス・アレイから構成される。このビデオＲＡＭは、ＲＡＭアレイと順次アクセス・アレイの間のデータ転送のための粗タイミング位置を示す外部コントローラからのＲＡＳクロックなどの刺激を検出するアドレス／制御論理回路を有する。制御論理回路は、内部的に順次クロックと同期化される制御信号を供給し、この制御信号は、タップ・ポインタがプログラム可能目標値または入力目標アドレスより１つ小さい値に等しい期間の間に発生する。これによって、入力行アドレスに対応するＲＡＭアレイ内の行が、ＲＡＭアレイと順次アクセス・アレイの間で転送される。



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【特許請求の範囲】

【請求項１】データ転送を指令する刺激を外部コントローラから受け取るステップと、

タップ・ポインタがプログラム可能な目標値と等しい期間の間にＲＡＭ内の１行から順次アクセス・メモリへの、内部的に順次クロックに同期化されたデータ転送を実行するステップとを含む、ＲＡＭ、順次アクセス・メモリおよびタップ・ポインタを有するビデオＲＡＭ半導体メモリ・デバイス内での自己タイミング式データ転送の方法。

【請求項２】刺激が、データ転送信号の状態遷移であることを特徴とする、請求項１に記載のビデオＲＡＭ半導体メモリ・デバイス内での自己タイミング式データ転送の方法。

【請求項３】転送されるデータが、前の順次アクセス・メモリ内容より１つ大きい行アドレスを有するＲＡＭ行に含まれるデータであることを特徴とする、請求項１に記載のビデオＲＡＭ半導体メモリ・デバイス内での自己タイミング式データ転送の方法。

【請求項４】さらに、アドレス入力に存在する行アドレスを読み取るステップを含む、請求項１に記載のビデオＲＡＭ半導体メモリ・デバイス内での自己タイミング式データ転送の方法。

【請求項５】転送されるデータが、行アドレスに対応するＲＡＭ行に含まれるデータであることを特徴とする、請求項４に記載のビデオＲＡＭ半導体メモリ・デバイス内での自己タイミング式データ転送の方法。

【請求項６】刺激が、データ転送信号がイネーブル状態である時のＲＡＳの状態遷移であることを特徴とする、請求項４に記載のビデオＲＡＭ半導体メモリ・デバイス内での自己タイミング式データ転送の方法。

【請求項７】プログラム可能な目標値が、事前に選択された値にセットされることを特徴とする、請求項４に記載のビデオＲＡＭ半導体メモリ・デバイス内での自己タイミング式データ転送の方法。

【請求項８】データ転送を実行するステップが、列アドレスを事前に選択された値にセットするステップと、タップ・ポインタに列アドレスをロードするステップとを含むことを特徴とする、請求項４に記載のビデオＲＡＭ半導体メモリ・デバイス内での自己タイミング式データ転送の方法。

【請求項９】さらに、アドレス入力に存在する列アドレスを読み取るステップを含む、請求項４に記載のビデオＲＡＭ半導体メモリ・デバイス内での自己タイミング式データ転送の方法。

【請求項１０】プログラム可能な目標値が、事前に選択された値にセットされることを特徴とする、請求項９に記載のビデオＲＡＭ半導体メモリ・デバイス内での自己タイミング式データ転送の方法。

【請求項１１】プログラム可能な目標値が、列アドレス

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より１つ小さい値にセットされることを特徴とする、請求項９に記載のビデオＲＡＭ半導体メモリ・デバイス内での自己タイミング式データ転送の方法。

【請求項１２】列アドレスが、０であることを特徴とする、請求項１１に記載のビデオＲＡＭ半導体メモリ・デバイス内での自己タイミング式データ転送の方法。

【請求項１３】列アドレスを読み取るステップが、第１入力信号の状態の変化に応答して発生することを特徴とする、請求項９に記載のビデオＲＡＭ半導体メモリ・デバイス内での自己タイミング式データ転送の方法。

【請求項１４】第１入力信号が、ＣＡＳであることを特徴とする、請求項１３に記載のビデオＲＡＭ半導体メモリ・デバイス内での自己タイミング式データ転送の方法。

【請求項１５】データ転送を実行するステップが、タップ・ポインタに列アドレスをロードするステップを含むことを特徴とする、請求項９に記載のビデオＲＡＭ半導体メモリ・デバイス内での自己タイミング式データ転送の方法。

【請求項１６】さらに、アドレス入力に存在する目標アドレスを読み取るステップを含む、請求項４に記載のビデオＲＡＭ半導体メモリ・デバイス内での自己タイミング式データ転送の方法。

【請求項１７】プログラム可能な目標値が、目標アドレスより１つ小さい値にセットされることを特徴とする、請求項１６に記載のビデオＲＡＭ半導体メモリ・デバイス内での自己タイミング式データ転送の方法。

【請求項１８】データ転送を実行するステップが、列アドレスを事前に選択された値にセットするステップと、タップ・ポインタに列アドレスをロードするステップとを含むことを特徴とする、請求項１７に記載のビデオＲＡＭ半導体メモリ・デバイス内での自己タイミング式データ転送の方法。

【請求項１９】目標が、０に等しいことを特徴とする、請求項１７に記載のビデオＲＡＭ半導体メモリ・デバイス内での自己タイミング式データ転送の方法。

【請求項２０】さらに、アドレス入力に存在する列アドレスを読み取るステップを含む、請求項１７に記載のビデオＲＡＭ半導体メモリ・デバイス内での自己タイミング式データ転送の方法。

【請求項２１】列アドレスを読み取るステップが、第１入力信号の状態の変化に応答して発生することを特徴とする、請求項２０に記載のビデオＲＡＭ半導体メモリ・デバイス内での自己タイミング式データ転送の方法。

【請求項２２】第１入力信号が、ＣＡＳであることを特徴とする、請求項２１に記載のビデオＲＡＭ半導体メモリ・デバイス内での自己タイミング式データ転送の方法。

【請求項２３】データ転送を実行するステップが、タップ・ポインタに列アドレスをロードするステップを含む

ことを特徴とする、請求項２０に記載のビデオＲＡＭ半導体メモリ・デバイス内での自己タイミング式データ転送の方法。

【請求項２１】目標アドレスを読み取るステップが、第２入力信号の状態が変化する時に発生することを特徴とする、請求項１６に記載のビデオＲＡＭ半導体メモリ・デバイス内での自己タイミング式データ転送の方法。

【請求項２５】第２入力信号が、データ転送信号であることを特徴とする、請求項２４に記載のビデオＲＡＭ半導体メモリ・デバイス内での自己タイミング式データ転送の方法。

【請求項２６】行アドレスの読取りが、第３入力信号の状態が変化する時に発生することを特徴とする、請求項４に記載のビデオＲＡＭ半導体メモリ・デバイス内での自己タイミング式データ転送の方法。

【請求項２７】第３入力信号が、ＲＡＳであることを特徴とする、請求項２６に記載のビデオＲＡＭ半導体メモリ・デバイス内での自己タイミング式データ転送の方法。

【請求項２８】さらに、順次アクセス・メモリの内容を直列ポートから出力するステップを含む、請求項４に記載のビデオＲＡＭ半導体メモリ・デバイス内での自己タイミング式データ転送の方法。

【請求項２９】出力のステップが、データ転送を実行するステップの後に発生する最初の順次クロック・サイクルの立ち上がりエッジに応答して開始されることを特徴とする、請求項２８に記載のビデオＲＡＭ半導体メモリ・デバイス内での自己タイミング式データ転送の方法。

【請求項３０】ＲＡＭアレイと、
直列出力ポートを有する順次アクセス・アレイと、
アドレスを入力するためのアドレス入力と、
ＲＡＭアレイと順次アクセス・アレイとの間でのデータ転送の粗いタイミング位置を示す、外部コントローラからの刺激を検出するための感知手段と、
感知手段が刺激を検出するのに応答して、ＲＡＭアレイと順次アクセス・アレイとの間でのデータ転送を指令する制御信号を出力することを特徴とし、順次クロックに同期化され、タップ・ポインタがプログラム可能な目標値より１つ小さい値に等しい期間の間発生する制御信号を供給するための、制御論理回路と、
制御論理回路によって供給される制御信号に応答して、ＲＡＭアレイと順次アクセス・アレイとの間でデータを転送するための転送ゲートとを含む、ビデオＲＡＭ半導体メモリ・デバイス。

【請求項３１】刺激が、データ転送信号の状態遷移であることを特徴とする、請求項３０に記載のビデオＲＡＭ半導体メモリ・デバイス。

【請求項３２】転送されるデータが、前の順次アクセス・メモリ内容より１つ大きい行アドレスを有するＲＡＭ行に含まれるデータであることを特徴とする、請求項３０に記載のビデオＲＡＭ半導体メモリ・デバイス。



【請求項３３】転送されるデータが、アドレス入力で読み取られる行アドレスに対応するＲＡＭ行に含まれることを特徴とする、請求項３０に記載のビデオＲＡＭ半導体メモリ・デバイス。

【請求項３４】刺激が、データ転送信号がイネーブル状態である時のＲＡＳの状態遷移であることを特徴とする、請求項３０に記載のビデオＲＡＭ半導体メモリ・デバイス。

【請求項３５】プログラム可能な目標値が、事前に選択された値にセットされることを特徴とする、請求項３０に記載のビデオＲＡＭ半導体メモリ・デバイス。

【請求項３６】プログラム可能な目標値が、アドレス入力で読み取られた列アドレスより１つ小さい値にセットされることを特徴とする、請求項３０に記載のビデオＲＡＭ半導体メモリ・デバイス。

【請求項３７】列アドレスが０であることを特徴とする、請求項３６に記載のビデオＲＡＭ半導体メモリ・デバイス。

【請求項３８】列アドレスが、第１入力信号の状態の変化に応答して読み取られることを特徴とする、請求項３６に記載のビデオＲＡＭ半導体メモリ・デバイス。

【請求項３９】第１入力信号がＣＡＳであることを特徴とする、請求項３８に記載のビデオＲＡＭ半導体メモリ・デバイス。

【請求項４０】データ転送を指令する制御信号が出力されるのと同時に、制御論理回路が、列アドレスをタップ・ポインタにロードすることを特徴とする、請求項３６に記載のビデオＲＡＭ半導体メモリ・デバイス。

【請求項４１】プログラム可能な目標値が、アドレス入力で読み取られた目標アドレスより１つ小さい値にセットされることを特徴とする、請求項３３に記載のビデオＲＡＭ半導体メモリ・デバイス。

【請求項４２】目標アドレスが、０に等しいことを特徴とする、請求項４１に記載のビデオＲＡＭ半導体メモリ・デバイス。

【請求項４３】目標アドレスが、第２入力信号の状態の変化に応答して読み取られることを特徴とする、請求項４１に記載のビデオＲＡＭ半導体メモリ・デバイス。

【請求項４４】第２入力信号が、データ転送信号であることを特徴とする、請求項４３に記載のビデオＲＡＭ半導体メモリ・デバイス。

【請求項４５】列アドレスが、アドレス入力で読み取られることを特徴とする、請求項４１に記載のビデオＲＡＭ半導体メモリ・デバイス。

【請求項４６】データ転送を指令する制御信号が出力されるのと同時に、制御論理回路が、タップ・ポインタに列アドレスをロードすることを特徴とする、請求項４５に記載のビデオＲＡＭ半導体メモリ・デバイス。

【請求項４７】列アドレスが、第１入力信号の状態の変

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化に応答して読み取られることを特徴とする、請求項４５に記載のビデオＲＡＭ半導体メモリ・デバイス。

【請求項４８】第１入力信号が、ＣＡＳであることを特徴とする、請求項４７に記載のビデオＲＡＭ半導体メモリ・デバイス。

【請求項４９】行アドレスが、第３入力信号の状態の変化に応答して読み取られることを特徴とする、請求項３３に記載のビデオＲＡＭ半導体メモリ・デバイス。

【請求項５０】第３入力信号が、ＲＡＳであることを特徴とする、請求項４９に記載のビデオＲＡＭ半導体メモリ・デバイス。

【請求項５１】直列ポートが、データ転送の後の最初に発生する順次クロック・サイクルの立ち上がりエッジに応答して、順次アクセス・アレイの内容を出力し始めることを特徴とする、請求項３０に記載のビデオＲＡＭ半導体メモリ・デバイス。

【請求項５２】アドレス入力に存在する行アドレスを読み取るステップと、

アドレス入力に存在する列アドレスを読み取るステップと、

データ転送信号がイネーブル状態である時にＲＡＳの状態遷移を検出するステップと、

タップ・ポインタが列アドレスより１つ小さい値に等しい期間の間に、行アドレスに対応するＲＡＭ内の行から順次アクセス・メモリへ、内部的に順次クロックに同期化された状態で、行アドレスに対応するＲＡＭ行に含まれるデータを転送するステップとを含む、ＲＡＭ、順次アクセス・メモリおよびタップ・ポインタを有するビデオＲＡＭ半導体メモリ・デバイス内での自己タイミング式リアルタイム・データ転送の方法。

【請求項５３】列アドレスが０であることを特徴とする、請求項５２に記載のビデオＲＡＭ半導体メモリ・デバイス内での自己タイミング式リアルタイム・データ転送の方法。

【請求項５４】列アドレスを読み取るステップが、ＣＡＳの状態の変化に応答して発生することを特徴とする、請求項５２に記載のビデオＲＡＭ半導体メモリ・デバイス内での自己タイミング式リアルタイム・データ転送の方法。

【請求項５５】行アドレスを読み取るステップが、ＲＡＳの状態の変化に応答して発生することを特徴とする、請求項５２に記載のビデオＲＡＭ半導体メモリ・デバイス内での自己タイミング式リアルタイム・データ転送の方法。

【発明の詳細な説明】

【０００１】

【産業上の利用分野】本発明は、全般的には表示メモリ・サブシステム、グラフィックスおよび表示装置アダプタのシステムおよびサブシステムに関し、具体的は半導体メモリ・デバイスに関する。さらに具体的にいうと、

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本発明は、ビデオＲＡＭおよび同様のメモリ・デバイスに関する。

【０００２】

【従来の技術】ビデオＲＡＭ（ＶＲＡＭ）とは、２ポートＲＡＭ（ランダム・アクセス・メモリ）であり、本質的には従来のＤＲＡＭにメモリ・データを順次アクセスできる第２ポートを追加したものである。ＶＲＡＭは、ＲＡＭアレイ、順次アクセス・メモリ（ＳＡＭ）・アレイ、アドレス／制御論理回路および転送ゲートからなる。ＲＡＭアレイは、ＶＲＡＭの主（ＲＡＭ）ポートに接続され、ＤＲＡＭやＳＲＡＭのＲＡＭアレイと同一の形で振る舞う。ＳＡＭアレイは、シフト・レジスタと称する場合もあるが、ＶＲＡＭの副（ＳＡＭまたは直列）ポートに接続され、外部非同期クロックである順次クロックの制御下で順次アクセスできる。アドレス／制御論理回路は、ＲＡＭポートのアドレス多重化を管理し、ＶＲＡＭの制御と大域タイミング機能のすべてを提供する。転送ゲートは、アドレス／制御論理回路の制御下で、メモリ・データをＲＡＭアレイとＳＡＭアレイの間で受け渡しできるようにする機構である。

【０００３】ＶＲＡＭの利点は、ＲＡＭアレイとＳＡＭアレイの間でデータを転送しなければならない時を除いて、２つのポートを独立に非同期に操作できることである。ＳＡＭアレイは、通常はＲＡＭアレイ１行分の記憶容量を有し、完全に１行分のメモリ・データが、単一のデータ転送サイクルでＲＡＭとＳＡＭの間で転送される。２つのポートの独立非同期動作は、表示メモリ・サブシステムへの応用に優れており、この場合、ＲＡＭポートは表示メモリの内容更新に使用され、ＳＡＭポートは、ＣＲＴなどの表示装置上でラスタ化される表示データを供給する。ＲＡＭポートは、一般に、更新ハードウェア（たとえばグラフィックス・プロセッサ）の周波数で動作する。ＳＡＭポートは、一般に、表示装置の要件によって指定される周波数で動作する。表示装置上でラスタ化される表示データは、ＳＡＭポートから取得されるので、ＲＡＭポート帯域幅のほぼ全てを、表示メモリの内容の更新に使用できる。

【０００４】表示メモリ・サブシステムでは、ＶＲＡＭがＳＡＭポートに表示データを供給する。ＳＡＭアレイは、表示データの１行分の容量しかないので、表示フレームの時間の間、表示データの新しい行を連続的に再ロードされなければならない。一般に、表示データの新しい行のそれぞれは、前の行よりアドレスが１つ大きい行から取得される。ＲＡＭアレイから表示データの新しい行をＳＡＭアレイに再ロードする作業は、ＲＡＭポートでデータ転送サイクルを実行することによって達成される。ＲＡＭアレイとＳＡＭアレイの間でのデータの転送は、ＲＡＭポートでの通常のＤＲＡＭアクセス・サイクルに対する唯一の割込みである。このデータ転送は、２つの別個のタイプに分けることができる。すなわち、

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１　順次クロックが停止しており、ＳＡＭポートがインアクティブの時

２　順次クロックが動作しており、ＳＡＭポートがアクティブの時

【０００５】前者は通常、表示フレームの帰線消去期間中に次の水平走査線の表示データをＳＡＭにロードすることに関連しており、順次クロックが停止しているので、ＲＡＭポートでのデータ転送サイクルは、順次クロックと同期する必要がない。後者は通常、表示フレームの水平走査線に関するアクティブ・ビデオ期間に関連しており、順次クロックが動作しているので、ＳＡＭポートでの表示データに必要な継ぎ目のない流れを維持するために、ＲＡＭポートでのデータ転送サイクルを順次クロックと正確に同期させる必要がある。後者はしばしば、ＶＲＡＭの術語で「リアルタイム・データ転送」と称し、ＶＲＡＭベース表示サブシステムの術語で「ミッドライン再ロード」と称する。

【０００６】表示メモリ・サブシステムの設計では、「リアルタイム・データ転送」の制御とタイミングが大きな問題になる。「リアルタイム・データ転送」は、時間にクリティカルなリアルタイム・アクセスであり、ＲＡＭポートとＳＡＭポートの間の正確な同期を必要とする。このように時間にクリティカルなリアルタイム・アクセスは、アクセスの同期と制御のために複雑で高速な回路を必要とする可能性がある。このため、ＶＲＡＭベース表示メモリ・サブシステムの設計者は、しばしば、表示データの「ミッドライン再ロード」とそれに関連するＶＲＡＭの「リアルタイム・データ転送」を避けるために、柔軟性を犠牲にしたり表示メモリを活用しないことを選択する。

【０００７】多くのＶＲＡＭベース表示メモリ・サブシステムに使用されている、ミッドライン再ロードを避けるための通常の方法には、表示メモリの内容をビデオ表示画面にマッピングする方法に対する複数の制約が含まれる。この制約には、通常は下記が含まれる。

・表示フレームの最初の水平走査線の表示データの開始アドレスが固定される。

・後続水平走査線のそれぞれの開始アドレスを生成するためのアドレス増分が、表示メモリ・サブシステム内のＶＲＡＭのＳＡＭアレイの容量と等しい値か、その２進分数に固定される。

・水平走査線の長さは、表示データの量が表示メモリ・サブシステム内のＶＲＡＭのＳＡＭアレイの容量を超えないものにする必要がある。

【０００８】「ミッドライン再ロード」を避け、従って「リアルタイム・データ転送」を避けるためには、これらの制約のすべてを満たさなければならない。汎用のグラフィックス・アダプタや表示装置コントローラの場合、これらの制約を適用することはできない。

【０００９】「リアルタイム・データ転送」を避けるためのもう１つの手段が、いわゆる「スプリット・レジスタ」機構を組み込んだ最近の１ＭＢ　ＶＲＡＭの一部に見られる。これらのＶＲＡＭでは、ＳＡＭアレイが、いわゆる「スプリット・レジスタ・データ転送」によって独立にロードすることのできる２つの半分に分割され、これによって、ＳＡＭの半分がアクティブである間にＳＡＭの他方の半分にロードすることが可能になっている。この機構は、問題の軽減に大いに役立つが、ＳＡＭアレイの容量を完全かつ効率的に利用してはおらず、潜在的に、「スプリット・レジスタ」機構を使用しない時に必要になるはずのデータ転送アクセスの２倍のアクセスをもたらす可能性がある。

【００１０】時間にクリティカルなデータ転送に必要な高精度を維持しながら「リアルタイム・データ転送」を可能にする、代替手法の提案の１つが、転送に関するタイミングのすべてを、コントローラを介して外部から供給するのではなく、ＶＲＡＭの内部で維持するというものである。この場合、ＶＲＡＭに事前プログラミングされたパラメータに基づいて、すべての転送が自動的にＶＲＡＭによって内部的に開始され、順次クロックと同期化されるので、転送が簡単に順次出力ストリームと同期化される。この手法を用いる場合、外部制御はタイミングに導入されず、したがって、リアルタイム・データ転送に必要な高精度のタイミングが達成される。

【００１１】しかし、この手法にはいくつかの短所がある。第１に、内部タイミングによる転送に適応するために、ＶＲＡＭ設計が非常に複雑になり、通常のＶＲＡＭと非互換になる。第２に、パラメータが静的であり、通常動作中の順次データ出力の再配列が困難になっているので、この設計は柔軟性に欠ける。第３に、このＶＲＡＭは、内部データ転送を行っている時に、ＲＡＭポートでの同時アクセスを回避するために、ＶＲＡＭメモリ・コントローラにビジー信号を供給するか、待ち状態をもたらす必要があるはずである。第４に、このビジー・プロトコルの処理のために、特に複数のＶＲＡＭからのビジー信号を管理しなければならない場合に、ビデオ・コントローラ回路の複雑さが増す。さらに、このビジー・ハンドシェーク・プロトコルが存在するが故に、既存のビデオ・コントローラのいずれもが、このＶＲＡＭと共に利用するのに適したものでなくなる。

【００１２】

【発明が解決しようとする課題】本発明の目的は、従来のビデオ・ランダム・アクセス・メモリ（ＶＲＡＭ）・デバイスに対する新規の機能強化によって、通常はＶＲＡＭベース・メモリ・サブシステムに使用されるリアルタイム・データ転送に関連する潜在的に複雑で高速な回路の必要を、簡単かつ効率的に除去することである。本発明のもう１つの目的は、厳密なマッピング制限がシステムに課せられず、ＳＡＭの効率が犠牲にされないようにすることである。本発明のもう１つの目的は、過度に

複雑でなく、非常に柔軟かつ動的であり、待ち状態ハンドシェーク・プロトコルを導入せず、既存のビデオ・コントローラとの完全な互換性を有し、従来のＶＲＡＭデータ転送の自然な拡張であるＶＲＡＭ回路設計を提供することである。

【００１３】

【課題を解決するための手段】本発明によれば、ビデオＲＡＭ半導体メモリ・デバイスが、行アドレス、列アドレスおよび目標アドレスを入力するためのアドレス入力を有するＲＡＭアレイと、順次出力ポートを有する順次アクセス・アレイから構成される。このビデオＲＡＭは、ＲＡＭアレイと順次アクセス・アレイの間のデータ転送のための粗タイミング位置を示す外部コントローラからのＲＡＳクロックなどの刺激を検出するアドレス／制御論理回路を有する。制御論理回路は、内部的に順次クロックと同期化される制御信号を供給し、この制御信号は、タップ・ポインタがプログラム可能目標値または入力目標アドレスより１つ小さい値に等しい期間の間に発生する。これによって、入力行アドレスに対応するＲＡＭアレイ内の行が、ＲＡＭアレイと順次アクセス・アレイの間で転送される。

【００１４】本発明の上記ならびに他の目的、特徴および長所は、下記の詳細な説明から明らかになる。

【００１５】

【実施例】これより図面を参照するが、具体的には図１を参照すると、本発明の好ましい実施例によるＶＲＡＭのブロック図が示されている。このＶＲＡＭには、ＲＡＭアレイ１０、ＳＡＭアレイ２０、アドレス／制御論理回路３０、転送ゲート４０およびタップ・ポインタ（ＴＡＰ）５０が含まれる。ＲＡＭアレイ１０は、ＶＲＡＭの主（ＲＡＭ）ポートに接続され、アドレス／制御論理回路３０の制御下でＤＲＡＭまたはＳＲＡＭと同一の形で振る舞う。ＳＡＭアレイ２０は、シフト・レジスタと呼ばれる場合もあるが、ＶＲＡＭの副（ＳＡＭまたは直列）ポートに接続され、外部非同期クロックである順次クロックの制御下で順次アクセスすることができる。ＳＡＭアレイ２０に対する順次アクセスは、タップ・ポインタ（ＴＡＰ）５０によって制御され、タップ・ポインタ（ＴＡＰ）５０は、順次クロックのサイクルごとに増分されるカウンタからＳＡＭアレイ２０のアドレスを生成する。タップ・ポインタ（ＴＡＰ）５０は、アドレス／制御論理回路３０の制御下で初期値をロードされ、そのカウントの末尾に達するまで順次クロックのサイクルごとにカウンタを増分し、末尾に達した後には、ラップして最初の値に戻る。アドレス／制御論理回路３０は、アドレス多重化とＲＡＭポート上のデータ・フローを管理し、ＶＲＡＭの制御と大域タイミング機能のすべてを提供する。転送ゲート４０は、アドレス／制御論理回路３０の制御下で、ＲＡＭアレイ１０とＳＡＭアレイ２０の間でメモリ・データを受け渡しできるようにする機構である。

【００１６】ここで図２を参照すると、順次クロックがインアクティブの状態での通常のデータ読取り転送サイクルのタイミング図が示されている。通常のＶＲＡＭでは、データ読取り転送サイクルは、行アドレス・ストローブ（ＲＡＳ）の立ち下がりエッジでデータ転送／出力イネーブル（ＤＴ／ＯＥ）をロー・レベルにセットすることによって示される。ＲＡＳの立ち下がりエッジでは、アドレス入力から行アドレス（Ｒ）が取得され、行Ｒがアクティブにされる。列アドレス・ストローブ（ＣＡＳ）の立ち下がりエッジでは、アドレス入力から列アドレス（Ｃ）が取得される。その後、ＤＴ／ＯＥの立ち上がりエッジで、実際のＲＡＭ→ＳＡＭデータ転送が発生する。データ転送時には、ＳＡＭアレイ２０に、ＲＡＭアレイ１０の行Ｒの内容がロードされ、タップ・ポインタ（ＴＡＰ）５０に、列アドレスＣがロードされる。実際のデータ転送後の順次クロックの最初の立ち上がりエッジで、ＳＡＭアレイ２０の新しい内容が、最初の順次クロック立ち上がりエッジの時刻でのタップ・ポインタ値によって与えられるＳＡＭ位置から始まるＳＡＭポートで使用可能になる。順次データの最初の項目は、列アドレスＣの行Ｒからのデータである（このデータの簡略表記が｛Ｒ；Ｃ｝である。本明細書全体を通じて、データの記述のすべてを簡略化するためにこの表記を使用する）。順次クロックの後続の立ち上がりエッジのそれぞれで、タップ・ポインタ（ＴＡＰ）５０の増分が発生し、ＳＡＭポートにＳＡＭアレイ２０の内容が順次提示される。すなわち、｛Ｒ；Ｃ｝の後に、｛Ｒ；Ｃ＋１｝、｛Ｒ；Ｃ＋２｝などが続く。

【００１７】図３は、順次クロックがアクティブの状態での、いわゆる「リアルタイム・データ転送」の通常のデータ読取り転送サイクルのタイミング図である。図３からわかるように、順次クロックが動作している状態でデータ読取り転送が実行される場合、ＳＡＭポートでのデータの正しいシーケンスを維持するために、ＤＴ／ＯＥの立ち上がりエッジによって示されるデータ転送のタイミングは、正しい順次クロック・サイクル中に発生するように正確に維持されなければならない。現在のＶＲＡＭは、最小１５ｎｓの順次クロック・サイクルを有し、通常は、ＤＴ／ＯＥの立ち上がりエッジが、前の順次クロックの立ち上がりエッジから５ｎｓ以上後、次の順次クロックの立ち上がりエッジから５ｎｓ以上前に発生することを必要とする。これは、転送のタイミングを、５ｎｓの狭さになる可能性のある「窓」の中に納めなければならず、非常に高速の回路が必要になることを意味する。将来のＶＲＡＭは、さらに高速の順次クロックを有する可能性があり、「窓」もそれ相応に狭くなる可能性がある。

【００１８】本発明の自己タイミング式リアルタイム・データ転送ＶＲＡＭは、高速の外部制御回路を必要とせ

ずに、非常に狭いタイミング「窓」の中でリアルタイム・データ転送のタイミングを正確に定める能力を有する。このＶＲＡＭは、外部コントローラが転送タイミングを供給することを必要とするのではなく、タイミングにクリティカルなリアルタイム・アクセスを簡単かつ効率的に同期化する内部タイミング式データ転送を介してこのような高精度をもたらす。

【００１９】ここで図１を参照すると、本発明の好ましい実施例による３パラメータの一般事例での自己タイミング式データ転送（ＳＴＤＴ）リアルタイム・データ読取り転送サイクルのタイミング図が示されている。この図には、ＳＴＤＴ機能の制御の有利な手段が示されている。当業者であれば了解できるように、制御入力の相対タイミング、シーケンス、極性および動作機能を変更した、他の有利な制御手段を考案することができる。ＳＴＤＴアクセスの実際の動作は、ＳＴＤＴ機能が従来のリアルタイム・データ転送アクセスの代替として提供されるのか、それに追加して提供されるのかを含む、複数の要因に依存する。

【００２０】ＳＴＤＴ機能の最も一般的な場合では、３つのパラメータが必要である。必要なパラメータは、下記のとおりである。

・Ｒ　行アドレス
・Ｃ　列アドレス
・Ｔ　ＳＴＤＴの目標

【００２１】この３つの必要なパラメータは、「ＳＴＤＴ目標」（Ｔ）が必ず列アドレス（Ｃ）と等しくなるようにすることによって、２つに減らすことができる。ここでは、３パラメータを有するＳＴＤＴ機能の一般事例を説明し、下で、２パラメータの事例（Ｃ＝Ｔ）を、ＳＴＤＴの有用な変形の例として説明する。ＳＴＤＴ機能のこのような他の変形および単純化の詳細と応用分野は、当業者であれば容易に識別できるであろう。

【００２２】ＲＡＳの立ち下がりエッジで、アドレス入力から行アドレス（Ｒ）を取得し、行Ｒをアクティブにする。さらに、ＲＡＳの立ち下がりエッジで、ＤＴ／ＯＥがロー・レベルであれば、そのアクセスがデータ読取り転送であることが示される（ＶＲＡＭでは通常こうなっている）。ＣＡＳの立ち下がりエッジで、アドレス入力から列アドレス（Ｃ）を取得する。ＤＴ／ＯＥの立ち上がりエッジで、入力アドレスから目標アドレスを取得し、ＳＴＤＴ目標を、目標アドレスと等しい値にセットする。タップ・ポインタが、ＳＴＤＴ目標より１つ少ない値に達し（ＴＡＰ＝Ｔ　１）、ＳＴＤＴ目標（Ｔ）へ増分されようとしている時に、順次クロックの立ち上がりエッジに応答してデータ転送が行われる。データ転送時には、データが行ＲとＳＡＭの間で転送され、タップ・ポインタに、列アドレス（Ｃ）がロードされる。

【００２３】データ転送後の最初の順次クロックの立ち上がりエッジに応答して、ＳＡＭの新しい内容が、直列ポートで使用可能になる。タップ・ポインタは、順次クロックに応答して、データ転送中にシーケンスＴ－２、Ｔ－１、Ｃ、Ｃ＋１、Ｃ＋２に従う。ＳＡＭポートでの直列データの流れは、このデータ転送中に継ぎ目なしにステップし、シーケンス｛Ｑ；Ｔ　２｝、｛Ｑ；Ｔ１｝、｛Ｒ；Ｃ｝、｛Ｒ；Ｃ＋１｝、｛Ｒ；Ｃ＋２｝に従う。おそらく、ほとんどの場合に、このシーケンスは、Ｑ＝Ｒ－１かつＣ＝Ｔ＝０であって、メモリ・アドレス空間内で連続したものになるはずである。しかし、このＳＴＤＴ機能の３パラメータの事例では、非常に有利な柔軟性と応用の有用性がもたらされる。

【００２４】ご存じのように、ＲＡＳ、ＣＡＳおよびＤＴ／ＯＥを含む、ビデオ表示システムの外部コントローラからのクロック刺激は、粗い粒度でのデータ転送のタイミングを示す。ＶＲＡＭがこの刺激を受け取ったならば、データ転送は、タップ・ポインタが目標アドレスより１つ小さい値に達する際に、内部的に順次クロックと同期化される。したがって、本発明のＶＲＡＭは、極度に狭いタイミング「窓」の間に転送を行うのに必要であり、直列ポートから順次データをリアルタイムで継ぎ目なしに転送するのに必要な微細タイミング粒度で、高精度自己タイミング式データ転送を行う能力を有する。

【００２５】図５は、本発明の好ましい実施例の２パラメータ事例（Ｃ＝Ｔ）でのＳＴＤＴリアルタイム・データ読取り転送サイクルのタイミング図である。この図は、ＳＴＤＴ機能の変形の制御の有利な手段を示す図である。前と同様に、制御入力の相対タイミング、シーケンス、極性および動作機能を変更した、他の有利な制御手段を考案することができる。２パラメータ事例（Ｃ＝Ｔ）は、行アドレスと列アドレスだけを供給する必要があり、ＤＴ／ＯＥの立ち上がりエッジのタイミングは、このＳＴＤＴの変形に本質的に無関係なので、同一のままにすることができるという点で、従来のデータ読取り転送とある種の共同作用を有する。

【００２６】ＲＡＳの立ち下がりエッジで、アドレス入力から行アドレス（Ｒ）を取得し、行Ｒをアクティブにする。さらに、ＲＡＳの立ち下がりエッジで、ＤＴ／ＯＥがロー・レベルであれば、そのアクセスがデータ読取り転送であることが示される（ＶＲＡＭでは通常こうなっている）。これは、ＳＴＤＴのＣ＝Ｔ変形でのＤＴ／ＯＥの唯一の機能であり、唯一のタイミング必要条件である。したがって、図５に示されているように、ＤＴ／ＯＥの立ち上がりエッジのタイミングは無関係である。ＣＡＳの立ち下がりエッジで、アドレス入力から列アドレス（Ｃ）を取得する。この２パラメータ変形では、列アドレス（Ｃ）がＳＴＤＴ目標でもある（Ｃ＝Ｔ）。タップ・ポインタが、ＳＴＤＴ目標より１つ少ない値に達し（ＴＡＰ＝Ｃ－１）、ＳＴＤＴ目標（Ｃ）へ増分されようとしている時に、順次クロックの立ち上がりエッジに応答してデータ転送が行われる。データ転送時には、

データが行ＲとＳＡＭの間で転送される。データ転送時にタップ・ポインタに列アドレス（Ｃ）をロードしてもよいが、タップ・ポインタは、順次クロックによってその値まで増分されるはずなので、この動作は不要である。

【００２７】データ転送後の最初の順次クロックの立ち上がりエッジに応答して、ＳＡＭの新しい内容が、直列ポートで使用可能になる。タップ・ポインタは、順次クロックに応答して、データ転送中にシーケンスＣ　２、Ｃ－１、Ｃ、Ｃ＋１、Ｃ＋２に従う。ＳＡＭポートでの直列データの流れは、このデータ転送中に継ぎ目なしにステップし、シーケンス｛Ｑ；Ｃ－２｝、｛Ｑ；Ｃ－１｝、｛Ｒ；Ｃ｝、｛Ｒ；Ｃ＋１｝、｛Ｒ；Ｃ＋２｝に従う。おそらく、ほとんどの場合に、このシーケンスは、Ｑ＝Ｒ－１かつＣ＝Ｔ＝０であって、メモリ・アドレス空間内で連続したものになるはずである。

【００２８】２パラメータ事例の代替事例が発生するのは、行アドレスと目標アドレスだけが入力される時である。列アドレスは、０になるか（Ｃ＝０）、ＶＲＡＭにプログラムされた事前に選択された別の値になり、ＳＴＤＴ目標（Ｔ）は、目標アドレスと同一にセットされる。タップ・ポインタが、ＳＴＤＴ目標より１つ少ない値に達し（ＴＡＰ＝Ｔ－１）、ＳＴＤＴ目標（Ｔ）へ増分されようとしている時に、順次クロックの立ち上がりエッジに応答してデータ転送が行われる。データ転送時には、データが行ＲとＳＡＭの間で転送され、タップ・ポインタに、事前に選択された列アドレス（Ｃ）がロードされる。

【００２９】ＳＴＤＴの１パラメータ変形または無パラメータ変形を実施することも可能である。１パラメータ事例では、行アドレスＲだけが供給され、列アドレスとＳＴＤＴ目標には、なんらかの事前に選択された値がセットされる。たとえば、ビット長５１２のＳＡＭの場合、ＳＴＤＴ目標を０にセットし、列アドレスを１２にセットすることができる。タップ・ポインタがＳＴＤＴ目標より１つ小さい値に達し、ＳＴＤＴ目標へ増分されようとしている時に、順次クロックの立ち上がりエッジに応答してデータ転送が行われる。この例では、タップ・ポインタが最大カウント値（すなわち、９ビットＴＡＰの場合は５１１または２進数の「１１１１１１１１１」）に達し、次の増分の際にラップアラウンドして０に戻ろうとしている時に、順次クロックに応答してデータ転送が行われる。データ転送時には、データがＲＡＭの行ＲとＳＡＭの間で転送され、タップ・ポインタに、列アドレス（Ｃ）、たとえば値１２がロードされる。

【００３０】無パラメータ事例では、列アドレスとＳＴＤＴ目標が、０または事前に選択された何らかの値になり、ＳＡＭの新しい内容になるデータの行アドレスが、ＳＡＭの前の内容をロードするのに使用された前の行アドレスより１つ大きい値になる。この０パラメータ事例では、行アドレス・シーケンスを起動し、再起動するための何らかの手段を使用できるようにする必要がある。それでも、外部コントローラからのタイミング刺激が、データ転送の粗タイミング位置を供給するために必要である。さらに、望むならば、３つを超えるパラメータを有するＳＴＤＴの変形を設けることが可能である。

【００３１】上で述べたどの事例でも、データ転送は、ＶＲＡＭデバイスによって内部的にタイミングを取られ、順次クロック・ストリームにデータ転送が同期化された。従来のリアルタイム・データ転送と異なり、ＳＴＤＴデータ転送は、ＲＡＭポートに制御信号を印加する外部回路によってタイミングを決定されるのではなく、ＶＲＡＭデバイス自体によってタイミングを決定されている。外部制御信号に対する唯一のタイミング必要条件は、データ転送の前に、ＳＴＤＴアクセスが開始され、必要なＳＴＤＴパラメータが供給されていることと、ＳＴＤＴアクセスがデータ転送の後に打ち切られることである。これらの必要条件を満足するには、複雑な回路や高速回路は必要ない。というのは、タイミング粒度を、高速順次クロック・ストリームへの同期に必要なものよりはるかに粗くすることができるからである。

【００３２】本発明を実施するのに必要な、従来のＶＲＡＭに対する追加修正のサイズは、ＶＲＡＭの全サイズを大きく増加させるものではない。ＶＲＡＭ設計にＳＴＤＴを実施するには、ＳＴＤＴ機能の検出と制御のためにＶＲＡＭのアドレス／制御論理回路にわずかな追加修正を行うことだけが必要である。また、ＴＡＰカウンタ回路に取り付けられる比較器を追加する必要がある。この比較器のビット数は、ＴＡＰカウンタのビット数（長さ５１２のＳＡＭの場合９ビット）と同一である。ＳＴＤＴ機能のうちの可能な変形の１つまたはすべてを、現在のＶＲＡＭ内で使用可能な通常のデータ転送アクセスの代わりに、またはそれに追加して提供することができる。さらに、本発明を、表示メモリ・サブシステムで使用されるものとして、主にデータ読取り転送（ＲＡＭ→ＳＡＭ）に関して説明してきたが、本発明は、現在のＶＲＡＭの一部に見られるデータ書込み転送（ＳＡＭ→ＲＡＭ）に関連して応用することもできる。

【００３３】好ましい実施例に関して本発明を具体的に図示し、説明してきたが、当業者であれば、本発明の趣旨と範囲から逸脱せずに形態と詳細にさまざまな変更を加えられることを理解するであろう。

【００３４】まとめとして、本発明の構成に関して以下の事項を開示する。

【００３５】（１）データ転送を指令する刺激を外部コントローラから受け取るステップと、タップ・ポインタがプログラム可能な目標値と等しい期間の間にＲＡＭ内の１行から順次アクセス・メモリへの、内部的に順次クロックに同期化されたデータ転送を実行するステップとを含む、ＲＡＭ、順次アクセス・メモリおよびタップ・

ポインタを有するビデオＲＡＭ半導体メモリ・デバイス内での自己タイミング式データ転送の方法。
（２）刺激が、データ転送信号の状態遷移であることを特徴とする、上記（１）に記載のビデオＲＡＭ半導体メモリ・デバイス内での自己タイミング式データ転送の方法。
（３）転送されるデータが、前の順次アクセス・メモリ内容より１つ大きい行アドレスを有するＲＡＭ行に含まれるデータであることを特徴とする、上記（１）に記載のビデオＲＡＭ半導体メモリ・デバイス内での自己タイミング式データ転送の方法。
（４）さらに、アドレス入力に存在する行アドレスを読み取るステップを含む、上記（１）に記載のビデオＲＡＭ半導体メモリ・デバイス内での自己タイミング式データ転送の方法。
（５）転送されるデータが、行アドレスに対応するＲＡＭ行に含まれるデータであることを特徴とする、上記（４）に記載のビデオＲＡＭ半導体メモリ・デバイス内での自己タイミング式データ転送の方法。
（６）刺激が、データ転送信号がイネーブル状態である時のＲＡＳの状態遷移であることを特徴とする、上記（４）に記載のビデオＲＡＭ半導体メモリ・デバイス内での自己タイミング式データ転送の方法。
（７）プログラム可能な目標値が、事前に選択された値にセットされることを特徴とする、上記（４）に記載のビデオＲＡＭ半導体メモリ・デバイス内での自己タイミング式データ転送の方法。
（８）データ転送を実行するステップが、列アドレスを事前に選択された値にセットするステップと、タップ・ポインタに列アドレスをロードするステップとを含むことを特徴とする、上記（４）に記載のビデオＲＡＭ半導体メモリ・デバイス内での自己タイミング式データ転送の方法。
（９）さらに、アドレス入力に存在する列アドレスを読み取るステップを含む、上記（４）に記載のビデオＲＡＭ半導体メモリ・デバイス内での自己タイミング式データ転送の方法。
（１０）プログラム可能な目標値が、事前に選択された値にセットされることを特徴とする、上記（９）に記載のビデオＲＡＭ半導体メモリ・デバイス内での自己タイミング式データ転送の方法。
（１１）プログラム可能な目標値が、列アドレスより１つ小さい値にセットされることを特徴とする、上記（９）に記載のビデオＲＡＭ半導体メモリ・デバイス内での自己タイミング式データ転送の方法。
（１２）列アドレスが、０であることを特徴とする、上記（１１）に記載のビデオＲＡＭ半導体メモリ・デバイス内での自己タイミング式データ転送の方法。
（１３）列アドレスを読み取るステップが、第１入力信号の状態の変化に応答して発生することを特徴とする、上記（９）に記載のビデオＲＡＭ半導体メモリ・デバイス内での自己タイミング式データ転送の方法。
（１４）第１入力信号が、ＣＡＳであることを特徴とする、上記（１３）に記載のビデオＲＡＭ半導体メモリ・デバイス内での自己タイミング式データ転送の方法。
（１５）データ転送を実行するステップが、タップ・ポインタに列アドレスをロードするステップを含むことを特徴とする、上記（９）に記載のビデオＲＡＭ半導体メモリ・デバイス内での自己タイミング式データ転送の方法。
（１６）さらに、アドレス入力に存在する目標アドレスを読み取るステップを含む、上記（４）に記載のビデオＲＡＭ半導体メモリ・デバイス内での自己タイミング式データ転送の方法。
（１７）プログラム可能な目標値が、目標アドレスより１つ小さい値にセットされることを特徴とする、上記（１６）に記載のビデオＲＡＭ半導体メモリ・デバイス内での自己タイミング式データ転送の方法。
（１８）データ転送を実行するステップが、列アドレスを事前に選択された値にセットするステップと、タップ・ポインタに列アドレスをロードするステップとを含むことを特徴とする、上記（１７）に記載のビデオＲＡＭ半導体メモリ・デバイス内での自己タイミング式データ転送の方法。
（１９）目標が、０に等しいことを特徴とする、上記（１７）に記載のビデオＲＡＭ半導体メモリ・デバイス内での自己タイミング式データ転送の方法。
（２０）さらに、アドレス入力に存在する列アドレスを読み取るステップを含む、上記（１７）に記載のビデオＲＡＭ半導体メモリ・デバイス内での自己タイミング式データ転送の方法。
（２１）列アドレスを読み取るステップが、第１入力信号の状態の変化に応答して発生することを特徴とする、上記（２０）に記載のビデオＲＡＭ半導体メモリ・デバイス内での自己タイミング式データ転送の方法。
（２２）第１入力信号が、ＣＡＳであることを特徴とする、上記（２１）に記載のビデオＲＡＭ半導体メモリ・デバイス内での自己タイミング式データ転送の方法。
（２３）データ転送を実行するステップが、タップ・ポインタに列アドレスをロードするステップを含むことを特徴とする、上記（２０）に記載のビデオＲＡＭ半導体メモリ・デバイス内での自己タイミング式データ転送の方法。
（２４）目標アドレスを読み取るステップが、第２入力信号の状態が変化する時に発生することを特徴とする、上記（１６）に記載のビデオＲＡＭ半導体メモリ・デバイス内での自己タイミング式データ転送の方法。
（２５）第２入力信号が、データ転送信号であることを特徴とする、上記（２４）に記載のビデオＲＡＭ半導体メモリ・デバイス内での自己タイミング式データ転送の

方法。
（２６）行アドレスの読取りが、第３入力信号の状態が変化する時に発生することを特徴とする、上記（４）に記載のビデオＲＡＭ半導体メモリ・デバイス内での自己タイミング式データ転送の方法。
（２７）第３入力信号が、ＲＡＳであることを特徴とする、上記（２６）に記載のビデオＲＡＭ半導体メモリ・デバイス内での自己タイミング式データ転送の方法。
（２８）さらに、順次アクセス・メモリの内容を直列ポートから出力するステップを含む、上記（４）に記載のビデオＲＡＭ半導体メモリ・デバイス内での自己タイミング式データ転送の方法。
（２９）出力のステップが、データ転送を実行するステップの後に発生する最初の順次クロック・サイクルの立ち上がりエッジに応答して開始されることを特徴とする、上記（２８）に記載のビデオＲＡＭ半導体メモリ・デバイス内での自己タイミング式データ転送の方法。
（３０）ＲＡＭアレイと、直列出力ポートを有する順次アクセス・アレイと、アドレスを入力するためのアドレス入力と、ＲＡＭアレイと順次アクセス・アレイとの間でのデータ転送の粗いタイミング位置を示す、外部コントローラからの刺激を検出するための感知手段と、感知手段が刺激を検出するのに応答して、ＲＡＭアレイと順次アクセス・アレイとの間でのデータ転送を指令する制御信号を出力することを特徴とし、順次クロックに同期化され、タップ・ポインタがプログラム可能な目標値より１つ小さい値に等しい期間の間発生する制御信号を供給するための、制御論理回路と、制御論理回路によって供給される制御信号に応答して、ＲＡＭアレイと順次アクセス・アレイとの間でデータを転送するための転送ゲートとを含む、ビデオＲＡＭ半導体メモリ・デバイス。
（３１）刺激が、データ転送信号の状態遷移であることを特徴とする、上記（３０）に記載のビデオＲＡＭ半導体メモリ・デバイス。
（３２）転送されるデータが、前の順次アクセス・メモリ内容より１つ大きい行アドレスを有するＲＡＭ行に含まれるデータであることを特徴とする、上記（３０）に記載のビデオＲＡＭ半導体メモリ・デバイス。
（３３）転送されるデータが、アドレス入力で読み取られる行アドレスに対応するＲＡＭ行に含まれることを特徴とする、上記（３０）に記載のビデオＲＡＭ半導体メモリ・デバイス。
（３４）刺激が、データ転送信号がイネーブル状態である時のＲＡＳの状態遷移であることを特徴とする、上記（３０）に記載のビデオＲＡＭ半導体メモリ・デバイス。
（３５）プログラム可能な目標値が、事前に選択された値にセットされることを特徴とする、上記（３０）に記載のビデオＲＡＭ半導体メモリ・デバイス。
（３６）プログラム可能な目標値が、アドレス入力で読み取られた列アドレスより１つ小さい値にセットされることを特徴とする、上記（３０）に記載のビデオＲＡＭ半導体メモリ・デバイス。
（３７）列アドレスが０であることを特徴とする、上記（３６）に記載のビデオＲＡＭ半導体メモリ・デバイス。
（３８）列アドレスが、第１入力信号の状態の変化に応答して読み取られることを特徴とする、上記（３６）に記載のビデオＲＡＭ半導体メモリ・デバイス。
（３９）第１入力信号がＣＡＳであることを特徴とする、上記（３８）に記載のビデオＲＡＭ半導体メモリ・デバイス。
（４０）データ転送を指令する制御信号が出力されるのと同時に、制御論理回路が、列アドレスをタップ・ポインタにロードすることを特徴とする、上記（３６）に記載のビデオＲＡＭ半導体メモリ・デバイス。
（４１）プログラム可能な目標値が、アドレス入力で読み取られた目標アドレスより１つ小さい値にセットされることを特徴とする、上記（３３）に記載のビデオＲＡＭ半導体メモリ・デバイス。
（４２）目標アドレスが、０に等しいことを特徴とする、上記（４１）に記載のビデオＲＡＭ半導体メモリ・デバイス。
（４３）目標アドレスが、第２入力信号の状態の変化に応答して読み取られることを特徴とする、上記（４１）に記載のビデオＲＡＭ半導体メモリ・デバイス。
（４４）第２入力信号が、データ転送信号であることを特徴とする、上記（４３）に記載のビデオＲＡＭ半導体メモリ・デバイス。
（４５）列アドレスが、アドレス入力で読み取られることを特徴とする、上記（４１）に記載のビデオＲＡＭ半導体メモリ・デバイス。
（４６）データ転送を指令する制御信号が出力されるのと同時に、制御論理回路が、タップ・ポインタに列アドレスをロードすることを特徴とする、上記（４５）に記載のビデオＲＡＭ半導体メモリ・デバイス。
（４７）列アドレスが、第１入力信号の状態の変化に応答して読み取られることを特徴とする、上記（４５）に記載のビデオＲＡＭ半導体メモリ・デバイス。
（４８）第１入力信号が、ＣＡＳであることを特徴とする、上記（４７）に記載のビデオＲＡＭ半導体メモリ・デバイス。
（４９）行アドレスが、第３入力信号の状態の変化に応答して読み取られることを特徴とする、上記（３３）に記載のビデオＲＡＭ半導体メモリ・デバイス。
（５０）第３入力信号が、ＲＡＳであることを特徴とする、上記（４９）に記載のビデオＲＡＭ半導体メモリ・デバイス。
（５１）直列ポートが、データ転送の後の最初に発生する順次クロック・サイクルの立ち上がりエッジに応答し

て、順次アクセス・アレイの内容を出力し始めることを特徴とする、上記（３０）に記載のビデオＲＡＭ半導体メモリ・デバイス。

（５２）アドレス入力に存在する行アドレスを読み取るステップと、アドレス入力に存在する列アドレスを読み取るステップと、データ転送信号がイネーブル状態である時にＲＡＳの状態遷移を検出するステップと、タップ・ポインタが列アドレスより１つ小さい値に等しい期間の間に、行アドレスに対応するＲＡＭ内の行から順次アクセス・メモリへ、内部的に順次クロックに同期化された状態で、行アドレスに対応するＲＡＭ行に含まれるデータを転送するステップとを含む、ＲＡＭ、順次アクセス・メモリおよびタップ・ポインタを有するビデオＲＡＭ半導体メモリ・デバイス内での自己タイミング式リアルタイム・データ転送の方法。

（５３）列アドレスが０であることを特徴とする、上記（５２）に記載のビデオＲＡＭ半導体メモリ・デバイス内での自己タイミング式リアルタイム・データ転送の方法。

（５４）列アドレスを読み取るステップが、ＣＡＳの状態の変化に応答して発生することを特徴とする、上記（５２）に記載のビデオＲＡＭ半導体メモリ・デバイス内での自己タイミング式リアルタイム・データ転送の方法。

（５５）行アドレスを読み取るステップが、ＲＡＳの状態の変化に応答して発生することを特徴とする、上記（５２）に記載のビデオＲＡＭ半導体メモリ・デバイス内での自己タイミング式リアルタイム・データ転送の方法。

【図面の簡単な説明】

【図１】本発明の好ましい実施例によるＶＲＡＭのブロック図である。

【図２】順次クロックがインアクティブの状態での通常のデータ読取り転送サイクルのタイミング図である。

【図３】順次クロックがアクティブの状態での、いわゆる「リアルタイム・データ転送」の通常のデータ読取り転送サイクルのタイミング図である。

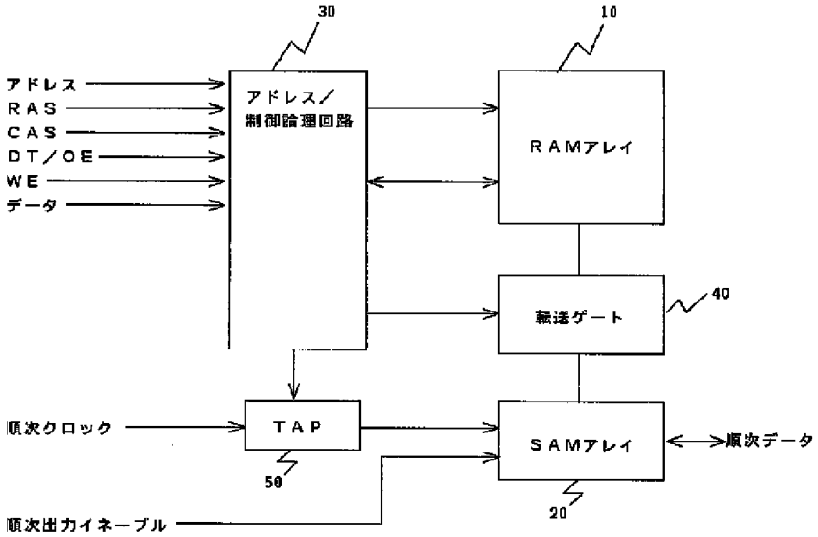
【図４】本発明の好ましい実施例による３パラメータの一般事例での自己タイミング式データ転送（ＳＴＤＴ）リアルタイム・データ読取り転送サイクルのタイミング図である。

【図５】本発明の好ましい実施例による２パラメータの事例でのＳＴＤＴリアルタイム・データ読取り転送サイクルのタイミング図である。

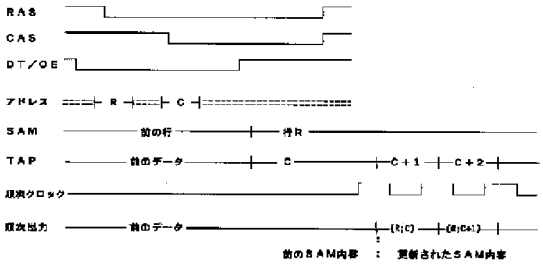
【符号の説明】

１０　ＲＡＭアレイ
２０　ＳＡＭアレイ
３０　アドレス／制御論理回路
４０　転送ゲート
５０　タップ・ポインタ（ＴＡＰ）

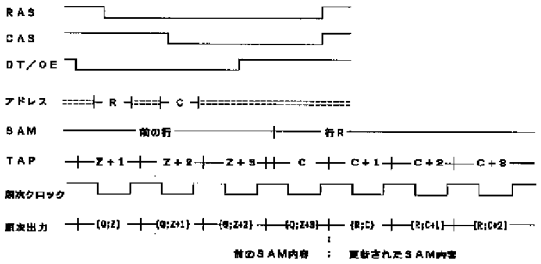
【図１】



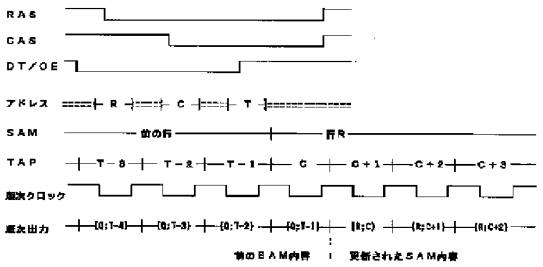
【図２】



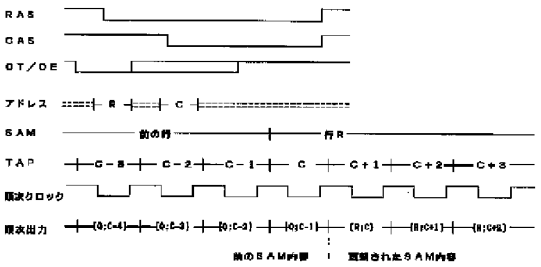

【図３】




【図４】




【図５】




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フロントページの続き

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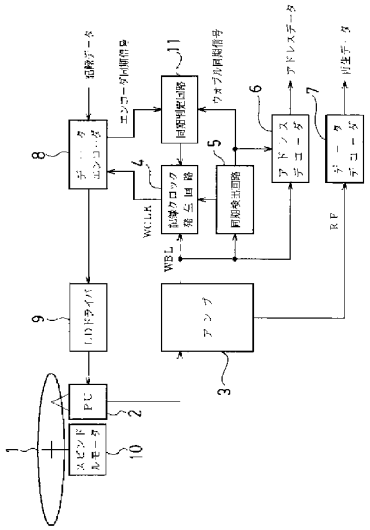
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(54)【発明の名称】データ記録用クロック信号発生装置

(57)【要約】
【目的】　ウォブル信号にアドレス情報などを位相変調によって重畳した光ディスクの場合でも、ウォブル信号に安定して位相同期した記録用クロックを発生させるようにする。
【構成】　この記録クロック発生回路４は、ウォブル信号を抽出し、記録用クロック信号を分周した分周クロック信号を発生し、上記ウォブル信号と上記分周クロック信号との位相を比較して位相差信号を発生し、上記位相差信号に基づく周波数制御信号を発生し、上記周波数制御信号に基づいて制御した周波数を有する上記記録用クロック信号を発生することにより、光ディスクのアドレス情報又は同期信号が位相変調された所定タイミングの近傍では位相差信号の発生を行なわせないようにする。
【選択図】　図１



【特許請求の範囲】
【請求項１】
所定の周波数成分を有し、所定タイミングでアドレス情報と同期信号とが位相変調によって重畳したウォブル信号でウォブリングされたデータ記録用トラックを有する光ディスクにデータを記録するときの前記ウォブル信号に位相同期させた記録用クロック信号を発生するデータ記録用クロック信号発生装置であって、
前記ウォブル信号を抽出するウォブル信号抽出手段と、
前記記録用クロック信号を分周した分周クロック信号を発生する記録用クロック信号分周手段と、
前記ウォブル信号と前記分周クロック信号との位相を比較して位相差信号を発生する位相差信号発生手段と、
該手段によって発生された前記位相差信号に基づく周波数制御信号を発生する周波数制御信号発生手段と、
該手段によって発生された前記周波数制御信号に基づいて制御した周波数を有する前記記録用クロック信号を発生する記録用クロック信号発生手段とを備え、
前記光ディスクの前記アドレス情報又は前記同期信号が位相変調された所定タイミングの近傍では前記位相差信号発生手段による位相差信号の発生を行なわせないようにする手段を設けたことを特徴とするデータ記録用クロック信号発生装置。
【発明の詳細な説明】
【技術分野】
【０００１】
この発明は、データ記録可能な光ディスク，ハードディスク等の記録媒体のデータ記録装置に備えるデータを記録するための記録用クロック信号を生成するデータ記録用クロック信号発生装置に関する。
【背景技術】
【０００２】
所定の周波数成分を有するウォブル信号でウォブリングされたデータ記録用トラックを有する光ディスクとして、ＣＤ－Ｒ，ＣＤ－ＲＷ，ＤＶＤ－Ｒ，及びＤＶＤ－ＲＡＭなどの記録媒体（メディア）が知られており、これらの光ディスクのウォブル信号に位相同期した記録用クロック信号を発生させるデータ記録用クロック信号発生装置（例えば、特許文献１，特許文献２参照）がある。
【０００３】
また、データ書き換え型光ディスクの性質として、同じ場所に何度も繰り返して記録すると、記録マークおよびその周辺が熱的ストレスなどによって劣化し、次に異なる信号を記録した時には、マークが正確に記録できないという性質があるが、このような問題を軽減するために、記録開始点をランダムに可変にし、同じ場所を繰り返して使用することを防ぐことによって、ディスク材料の疲労を平均化して軽減し、結果的に繰り返し使用回数を向上させる光ディスクの記録方法及び光ディスク装置（例えば、特許文献３，特許文献４参照）があった。
【０００４】
さらに、ウォブル信号にアドレス情報などを位相変調によって重畳した光ディスク（例えば、特許文献５参照）があり、光ディスクのウォブル信号に位相同期した記録用クロック信号を発生させるデータ記録用クロック信号発生装置もある。
【０００５】
図１４は、従来の光ディスク駆動装置の構成例を示すブロック図である。
まず、光ディスク１には、所定の周波数成分を有するウォブル信号でウォブリングされたデータ記録用トラックが存在する。
【０００６】
図１５は、光ディスク１上のウォブリングされたデータ記録用トラックの構造例を示す説明図である。

トラックの位置を示すグルーブ部がアドレス情報に対応してウォブリングされており、ウォブル信号にはアドレス情報と同期信号とが変調されて重畳されている。

【０００７】

図１４に示した従来の光ディスク駆動装置では、光ピックアップ（ＰＵ）２からは、光ディスク１上のデータ記録用トラックに向けて、レーザビームを照射する。

そして、光ディスク１上のトラックで反射されたレーザビームは、光ピックアップ２に戻され、光ピックアップ２内のディテクタで電気信号に変換される。

【０００８】

アンプ３は、光ピックアップ２で検出された電気信号を増幅し、光ディスク１上に記録されたデータに対応する再生信号（ＲＦ）と、トラックのウォブリングに対応したウォブル信号（ＷＢＬ）を出力する。

その再生信号（ＲＦ）は、データの再生を行なう場合に検出され、ウォブル信号（ＷＢＬ）は、データの記録及び再生双方の動作で検出される。

【０００９】

記録クロック発生回路４は、ウォブル信号（ＷＢＬ）に位相同期した記録用クロック信号（ＷＣＬＫ）を発生する。

【００１０】

図１６は、図１４に示した従来の記録クロック発生回路の構成例を示すブロック図である。

この記録クロック発生回路４は、いわゆるＰＬＬ（Ｐｈａｓｅ Ｌｏｃｋｅｄ Ｌｏｏｐ）回路で構成される。

位相比較器４１は、ウォブル信号（ＷＢＬ）と、記録用クロック信号（ＷＣＬＫ）を分周器４５で所定比に分周した信号（分周クロック）との位相差を比較する。

【００１１】

位相比較器４１からの出力は、チャージポンプ４２によって電圧信号に変換された後、フィルタ４３で平滑化され、ＶＣＯ（Ｖｏｌｔａｇｅ Ｃｏｎｔｒｏｌｌｅｄ Ｏｓｃｉｌｌａｔｏｒ）に入力される。

ＶＣＯの出力クロック、すなわち記録用クロック信号（ＷＣＬＫ）は、入力電圧によってその周波数が制御される。その結果、記録用クロック信号（ＷＣＬＫ）の位相は、ウォブル信号（ＷＢＬ）に同期したものになる。

【００１２】

図１４に戻り、従来の光ディスク駆動装置の同期検出回路５とアドレスデコーダ６は、それぞれウォブル信号に重畳された同期信号とアドレス情報を検出する。

そして、データの記録を行なう場合、データエンコーダ８は、記録用クロック信号（ＷＣＬＫ）に同期して記録データに所定の変調処理を施す。

【００１３】

ＬＤドライバ９は、変調された記録データに応じて光ピックアップ２が出射するレーザビーム強度を変調する。

この結果、データ記録用トラックのウォブル信号に同期してデータの記録が行なわれる。

【特許文献１】特開平１０－２９３９２６号公報
【特許文献２】特開平１１－６６５６３号公報
【特許文献３】特公平８　１０４８９号公報
【特許文献４】特開平１０－３６６７号公報
【特許文献５】特開平１０－６９６４６号公報

【発明の開示】

【発明が解決しようとする課題】

【００１４】

しかしながら、上述した特許文献３に記載された技術は、記録開始点をランダムに可変にし、同じ場所を繰り返して使用することを防ぐことによって、ディスク材料の疲労を平

均化して軽減し、結果的に繰り返し使用回数を向上させるものであり、そのランダムな記録開始点を得るために複数のアナログディレイ回路を使用しなければならないので装置コストが高価になるという問題があった。

【００１５】

次に、上述したような従来の記録クロック発生回路では、ウォブル信号が正常に検出されていれば、記録用クロック信号（ＷＣＬＫ）の位相は、常にウォブル信号（ＷＢＬ）に同期したものとなる。

【００１６】

しかし、光ディスク上には小さな欠陥が存在する場合もあり、また、光ディスク表面にごみなどが付着する場合もあり、このような欠陥やゴミなどが付着した部分ではウォブル信号に欠落が生じ、正常な検出がされなくなる場合がある。

【００１７】

そこで、上述したような従来のＰＬＬ回路で構成された記録クロック発生回路では、いわゆるＰＬＬのフライホイール効果があるため、ウォブル信号の小さな欠落に対しては、ウォブル信号と記録用クロック信号との位相同期は保たれる。

【００１８】

しかし、ウォブル信号の欠落が大きい場合には、欠落中にウォブル信号と記録用クロック信号との位相がずれてしまい、欠落後、記録用クロック信号がウォブル信号周期の整数倍の位相ずれを生じた状態で位相同期する、いわゆるビットスリップが生じる場合がある。

【００１９】

そして、ビットスリップが生じた場合、ウォブル信号と記録用クロックの位相ずれは回復させることができず、記録データが所定位置からずれた状態で記録されることになる。

【００２０】

また、ビットスリップが生じたまま、あるセクタまでのデータの記録を完了させた後、続くセクタから新たにデータを記録させた場合に、記録データの接続部でデータの重なりや不要な空白が生じる。

このような場合、記録データ接続部付近のデータが正しく再生できなくなるという最悪の事態を招き易くなるという問題があった。

【００２１】

次に、ウォブル信号にアドレス情報などを位相変調によって重畳した光ディスク（例えば、特許文献５参照）の場合、位相変調のためにウォブル信号位相に急な変化が生じる部分があり、従来の記録クロック発生回路では、ウォブル信号と記録用クロック信号との位相ずれが生じてしまうという問題があった。

【００２２】

この発明は上記の課題を解決するためになされたものであり、ウォブル信号にアドレス情報などを位相変調によって重畳した光ディスクの場合でも、ウォブル信号に安定して位相同期した記録用クロックを発生させる記録クロック発生回路を提供することを目的とする。

【課題を解決するための手段】

【００２３】

この発明は上記の目的を達成するため、所定の周波数成分を有し、所定タイミングでアドレス情報と同期信号とが位相変調によって重畳したウォブル信号でウォブリングされたデータ記録用トラックを有する光ディスクにデータを記録するときの上記ウォブル信号に位相同期させた記録用クロック信号を発生するデータ記録用クロック信号発生装置であって、上記ウォブル信号を抽出するウォブル信号抽出手段と、上記記録用クロック信号を分周した分周クロック信号を発生する記録用クロック信号分周手段と、上記ウォブル信号と上記分周クロック信号との位相を比較して位相差信号を発生する位相差信号発生手段と、その手段によって発生された上記位相差信号に基づく周波数制御信号を発生する周波数制御信号発生手段と、その手段によって発生された上記周波数制御信号に基づいて制御した

周波数を有する上記記録用クロック信号を発生する記録用クロック信号発生手段とを備え、上記光ディスクの上記アドレス情報又は上記同期信号が位相変調された所定タイミングの近傍では上記位相差信号発生手段による位相差信号の発生を行なわせないようにする手段を設けたデータ記録用クロック信号発生装置を提供する。

【発明の効果】

【００２４】

この発明による記録クロック発生装置は、位相変調によってウォブル信号位相に急な変化が生じる部分で位相比較器の動作をマスクするので、ウォブル信号と記録用クロック信号との位相ずれが生じることが無くなり、ウォブル信号に安定して位相同期した記録用クロックを発生させることができる。

【発明を実施するための最良の形態】

【００２５】

以下、この発明を実施するための最良の形態を図面に基づいて具体的に説明する。

図１は、この発明の参考例及びこの発明の一実施形態である光ディスク駆動装置の構成例を示すブロック図であり、図１４に示した光ディスク駆動装置と共通する部分には同一符号を付してその説明を省略する。

【００２６】

この光ディスク駆動装置の記録クロック発生回路４は、所定の周波数成分を有するウォブル信号でウォブリングされたデータ記録用トラックを有する光ディスク１にデータを記録するときの上記ウォブル信号に位相同期させた記録用クロック信号を発生するデータ記録用クロック信号発生装置であり、その記録クロック発生回路４等がこの発明及びこの発明の参考例に係る以下の各手段の機能を果たす。

【００２７】

上記ウォブル信号を抽出するウォブル信号抽出手段と、上記記録用クロック信号を分周した分周クロック信号を発生する記録用クロック信号分周手段と、上記ウォブル信号と上記分周クロック信号との位相を比較して位相差信号を発生する位相差信号発生手段と、その手段によって発生された上記位相差信号に基づく周波数制御信号を発生する周波数制御信号発生手段と、その手段によって発生された上記周波数制御信号に基づいて制御した周波数を有する上記記録用クロック信号を発生する記録用クロック信号発生手段とを備え、上記記録用クロック信号分周手段が上記記録用クロック信号を分周するときの基準分周比とその基準分周比とは異なる分周比とを所定の順序に従って設定する分周比設定手段。

【００２８】

また、上記光ディスクにデータを記録する毎に、上記記録用クロック分周手段に対して設定する基準分周比とその基準分周比とは異なる分周比の組み合わせの順序を異ならせる手段。

【００２９】

さらに、上記ウォブル信号に重畳されている同期信号を検出する同期検出手段と、その手段によって検出された上記同期信号と上記光ディスクの記録データとの同期関係を判定する同期関係判定手段と、その手段によって上記同期信号に対して上記記録データのタイミングが遅れているものと判定された場合、上記記録用クロック分周手段に設定する分周比の平均値が上記基準分周比よりも長い値になるようにし、上記同期信号に対して上記記録データのタイミングが進んでいるものと判定された場合、上記記録用クロック分周手段に設定する分周比の平均値が上記基準分周比よりも短い値になるようにする制御手段。

【００３０】

また、所定の周波数成分を有し、所定タイミングでアドレス情報と同期信号とが位相変調によって重畳したウォブル信号でウォブリングされたデータ記録用トラックを有する光ディスクにデータを記録するときの上記ウォブル信号に位相同期させた記録用クロック信号を発生するデータ記録用クロック信号発生装置であって、上記ウォブル信号を抽出するウォブル信号抽出手段と、上記記録用クロック信号を分周した分周クロック信号を発生する記録用クロック信号分周手段と、上記ウォブル信号と上記分周クロック信号との位相を

比較して位相差信号を発生する位相差信号発生手段と、その手段によって発生された上記位相差信号に基づく周波数制御信号を発生する周波数制御信号発生手段と、その手段によって発生された上記周波数制御信号に基づいて制御した周波数を有する上記記録用クロック信号を発生する記録用クロック信号発生手段とを備え、上記光ディスクの上記アドレス情報又は上記同期信号が位相変調された所定タイミングの近傍では上記位相差信号発生手段による位相差信号の発生を行なわせないようにする手段。

【００３１】

さらに、所定の周波数成分を有するウォブル信号でウォブリングされたデータ記録用トラックを有する光ディスクにデータを記録するときの上記ウォブル信号に位相同期した記録用クロック信号を発生するデータ記録用クロック信号発生装置であって、上記ウォブル信号を抽出するウォブル信号抽出手段と、上記記録用クロック信号を分周した分周クロックを発生する記録用クロック信号分周手段と、上記ウォブル信号と上記分周クロック信号との位相を比較して位相差信号を発生する位相差信号発生手段と、その手段によって発生された上記位相差信号に基づく第１の周波数制御信号を発生する第１周波数制御信号発生手段と、上記ウォブル信号を所定の分周比で分周するウォブル信号分周手段と、その手段によって分周されたウォブル信号の周期を上記記録用クロック信号の周期でカウントするウォブル信号周期カウント手段と、その手段によってカウントされた周期に基づく第２の周波数制御信号を発生する第２周波数制御信号発生手段と、上記ウォブル信号周期カウント手段によってカウントされた周期が所定の範囲内にある場合には上記第１周波数制御信号発生手段によって発生された第１の周波数制御信号によって制御した周波数を有する上記記録用クロック信号を発生し、上記周期が所定の範囲外にある場合には上記第２周波数制御信号発生手段によって発生された第２の周波数制御信号によって制御した周波数を有する上記記録用クロック信号を発生する記録用クロック信号発生手段。

【００３２】

さらにまた、所定の周波数成分を有するウォブル信号でウォブリングされたデータ記録用トラックを有する光ディスクにデータを記録するときの上記ウォブル信号に位相同期した記録用クロック信号を発生するデータ記録用クロック信号発生装置であって、上記ウォブル信号を抽出するウォブル信号抽出手段と、上記記録用クロック信号を分周した分周クロックを発生する記録用クロック信号分周手段と、上記ウォブル信号と前記分周クロック信号との位相を比較して位相差信号を発生する位相差信号発生手段と、その手段によって発生された上記位相差信号に基づく第１の周波数制御信号を発生する第１周波数制御信号発生手段と、上記ウォブル信号を所定の分周比で分周するウォブル信号分周手段と、その手段によって分周されたウォブル信号の周期を上記記録用クロック信号の周期でカウントするウォブル信号周期カウント手段と、その手段によってカウントされた周期に基づく第２の周波数制御信号を発生する第２周波数制御信号発生手段と、上記ウォブル信号周期カウント手段によってカウントされた周期が所定の範囲内にある場合には上記第１周波数制御信号発生手段によって発生された第１の周波数制御信号によって制御した周波数を有する上記記録用クロック信号を発生し、上記周期が所定の範囲外にあることが所定回数連続して検出された場合には上記第２周波数制御信号発生手段によって発生された第２の周波数制御信号によって制御した周波数を有する上記記録用クロック信号を発生する記録用クロック信号発生手段。

上記各機能については以下順に説明する。

【００３３】

まず、この発明の参考例の記録クロック発生回路について説明する。

図２は、図１に示したこの発明の参考例の記録クロック発生回路４の内部構成例を示すブロック図であり、図１６と共通する部分には同一符号を付している。

この記録クロック発生回路４は、いわゆるＰＬＬ（Ｐｈａｓｅ Ｌｏｃｋｅｄ Ｌｏｏｐ）回路で構成されており、ウォブル信号（ＷＢＬ）に位相同期した記録用クロック信号（ＷＣＬＫ）を発生する。

【００３４】

分周器４５は、分周比設定テーブル４７から出力される分周比制御信号に応じて記録用クロック信号（ＷＣＬＫ）を分周した分周クロック信号を出力する。
その分周クロック信号は、位相比較器４１にフィードバックされると共に、分周クロックカウンタ４６にも入力される。

【００３５】

分周クロックカウンタ４６は、分周クロック信号のエッジ毎にカウント値を変化させる。
分周比設定テーブル４７は、分周クロックカウンタ４６のカウント値と分周条件設定値に応じて分周器４５へ分周比制御信号を出力する。

【００３６】

図３は、上記分周器４５，分周クロックカウンタ４６，及び分周比設定テーブル４７のさらに詳細な構成例を示す図である。
この分周クロックカウンタ（２ｂｉｔ　Ｃｎｔ）４６は、２ビットカウンタで構成される。

【００３７】

また、分周器４５は、４ビットカウンタであるＡカウンタ（Ａ　Ｃｎｔ：４ｂｉｔ　Ｃｎｔ）４５１，３ビットカウンタであるＢカウンタ（Ｂ　Ｃｎｔ：３ｂｉｔ　Ｃｎｔ）４５２，同期式ＳＲＦＦ４５５，インバータ（Ｉｎｖ）４５３，及び３ｔｏ１構成のマルチプレクサ（Ｍｕｘ）４５４で構成される。

【００３８】

このＡカウンタ４５１，Ｂカウンタ４５２，及び同期式ＳＲＦＦ４５５には、図示を省略した記録用クロック信号（ＷＣＬＫ）をそれぞれ入力しており、以下の説明では、記録用クロック信号の１周期を１Ｔと表現する。

【００３９】

Ａカウンタ４５１，Ｂカウンタ４５２のカウントイネーブル入力（ＥＮ）には、それぞれ同期式ＳＲＦＦ４５５のＱｂ出力，Ｑ出力を接続している。

【００４０】

同期式ＳＲＦＦ４５５のＳ入力には、Ａカウンタ４５１のフルカウント出力（＝１５），すなわち、Ａカウンタ４５１のカウント値が最大値“１５”であることを示す信号を接続している。

【００４１】

同期式ＳＲＦＦ４５５のＲ入力には、Ｂカウンタ４５２のフルカウント出力（＝７），すなわち、Ｂカウンタ４５２のカウント値が最大値“７”であることを示す信号を接続している。

【００４２】

Ａカウンタ４５１のフルカウント出力（＝１５）は、Ｂカウンタ４５２のロード入力（ＬＤ）にも接続している。
Ｂカウンタ４５２のフルカウント出力（－７）は、Ａカウンタ４５１のロード入力（ＬＤ）にも接続している。

【００４３】

Ａカウンタ４５１のデータ入力（Ｄｉ）には、“７”，“８”，“９”の各値の中からマルチプレクサ４５４で選択された一つの値が入力され、ロード（ＬＤ）入力がアクティブになった場合には、Ａカウンタ４５１のカウント値は“７”，“８”，“９”のいずれかの値に設定される。

【００４４】

Ｂカウンタ４５２のデータ入力（Ｄｉ）には、値“０”が入力され、ロード（ＬＤ）入力がアクティブになった場合には、Ｂカウンタ４５２のカウント値は“０”に設定される。

【００４５】

次に、分周器４５の動作について説明する。

ＡカウンタＡ５１とＢカウンタＡ５２は、交互にカウント動作を行なう。
ＡカウンタＡ５１は、マルチプレクサＡ５４で選択される値によって、“７”，“８”，“９”のいずれかの初期値から、最終値“１５”までのカウント動作を行なう。
つまり、ＡカウンタＡ５１は１回のカウント動作で７Ｔ分，８Ｔ分，又は９Ｔ分のカウントを行なう。

【００４６】

ＢカウンタＡ５２は、初期値“０”から最終値“７”までのカウント動作を行なう。
つまり、ＢカウンタＡ５２は１回のカウント動作で８Ｔ分のカウントを行なう。

【００４７】

また、分周クロックは、同期式ＳＲＦＦＡ５５のＱ出力をインバータＡ５３で反転させた信号である。
したがって、分周クロック１サイクル分の動作は、ＡカウンタＡ５１の１回のカウント動作と、ＢカウンタＡ５２の１回のカウント動作とを組み合わせたものであり、その周期は１５Ｔ分，１６Ｔ分，又は１７Ｔ分になる。

【００４８】

すなわち、分周器Ａ５の基準分周比は“１６”になり、その基準分周比に対して±１の分周比変化を可能にしている。

【００４９】

分周クロックカウンタＡ６のカウントイネーブル入力（ＥＮ）には、Ｂカウンタのフルカウント出力（＝７）を接続している。
そのため、分周クロックカウンタＡ６は、ＡカウンタＡ５１の１回のカウント動作とＢカウンタＡ５２の１回のカウント動作とを組み合わせた分周クロックの１サイクル分の動作の終了毎に、そのカウント値をアップさせる。
分周クロックカウンタＡ６は、ここでは２ビットカウンタなので、カウント値は０から３までの値になる。

【００５０】

分周比設定テーブルＡ７には、分周クロックカウンタＡ６から２ビットのカウントデータと、分周条件設定値として２ビットのデータとが入力される。
分周比設定テーブルＡ７は、分周クロックカウンタＡ６のカウント値と分周条件設定値とに応じて、表１に示す真理値表にしたがって分周比制御信号を出力する。

【００５１】

【表１】

| 分周条件設定値 | 分周クロックカウンタ値 | Sel7 | Sel8 | Sel9 |
|---|---|---|---|---|
| 0 | 0 | 0 | 1 | 0 |
| | 1 | 0 | 1 | 0 |
| | 2 | 0 | 1 | 0 |
| | 3 | 0 | 1 | 0 |
| 1 | 0 | 0 | 0 | 1 |
| | 1 | 0 | 1 | 0 |
| | 2 | 0 | 1 | 0 |
| | 3 | 1 | 0 | 0 |
| 2 | 0 | 0 | 0 | 1 |
| | 1 | 1 | 0 | 0 |
| | 2 | 0 | 0 | 1 |
| | 3 | 1 | 0 | 0 |
| 3 | 0 | 0 | 1 | 0 |
| | 1 | 0 | 1 | 0 |
| | 2 | 0 | 0 | 1 |
| | 3 | 1 | 0 | 0 |

【００５２】
分周比設定テーブル４７の分周比制御信号はマルチプレクサ４５４に接続しており、その分周比制御信号に応じてＡカウンタ４５１の初期値が選択される。
マルチプレクサ４５４は、分周比制御信号（Ｓｅｌ７）がアクティブの場合には値“７”を選択し、分周比制御信号（Ｓｅｌ８）がアクティブの場合には値“８”を選択し、分周比制御信号（Ｓｅｌ９）がアクティブの場合には値“９”を選択する。
【００５３】
図４は、分周器４５の動作の説明に供するタイミング図であり、同図に基づいて図３に示した分周器４５の動作を詳細に説明する。
図４では４段のタイミング図を同時に示しているが、１段目が分周条件設定値＝０の場合，２段目が分周条件設定値＝１の場合，３段目が分周条件設定値＝２の場合，４段目が分周条件設定値＝３の場合のそれぞれの動作タイミングである。
【００５４】
また、同図の水平方向に分周クロックカウンタの値が“０”から“３”までのタイミング図を示しているが、分周クロックカウンタの値が“３”になった後は再び“０”の動作に戻る。
【００５５】
まず、分周条件設定値＝０の場合の動作を説明する。
表１の真理値表に基づいて、分周条件設定値＝０の場合は、分周比設定テーブル４７は、分周クロックカウンタ４６からのカウント値に関わらずに分周比制御信号（Ｓｅｌ８）のみをアクティブにする。
【００５６】
したがって、Ａカウンタ４５１の初期値は、すべての分周クロックサイクルの先頭で“７”にセットされ、Ａカウンタ４５１のカウント動作は、すべての分周クロックサイクルで８Ｔ分になり、分周クロック１サイクル分の周期は１６Ｔになる。
【００５７】
次に、分周条件設定値＝１の場合の動作を説明する。
分周クロックカウンタ値が“０”になる分周クロックサイクルにおけるＡカウンタ４５

１の初期値は、その直前、すなわち、分周クロックカウンタ４６のカウント値が“４”になる分周クロックサイクル最後のマルチプレクサ４５４からの出力によって決まる。

【００５８】

表１の真理値表に基づいて、分周条件設定値＝１，分周クロックカウンタ値＝４では、分周比制御信号（Ｓｅ１７）がアクティブになっているから、分周クロックカウンタ４６のカウント値が“０”になる分周クロックサイクルにおけるＡカウンタ４５１の初期値は“７”になる。

【００５９】

そのため、分周クロックカウンタ４６のカウント値が“０”になる分周クロックサイクルにおけるＡカウンタ４５１のカウント動作は９Ｔ分になり、分周クロック１サイクル分の周期は１７Ｔになる。

【００６０】

そして、上述と同様にして、分周クロックカウンタ４６のカウント値が“１”になる分周クロックサイクル周期は１５Ｔになる。

また、分周クロックカウンタ４６のカウント値が“２”になる分周クロックサイクル周期は１６Ｔになる。

さらに、分周クロックカウンタ４６のカウント値が“３”になる分周クロックサイクル周期は１６Ｔになる。

【００６１】

すなわち、分周条件設定値＝１の場合、分周クロック１サイクル分の周期は一定ではなく、「１７Ｔ→１５Ｔ→１６Ｔ→１６Ｔ→，１７Ｔ→１５Ｔ→１６Ｔ→１６Ｔ→，…」というパターンを繰り返す。

【００６２】

そして、上述と同様にして、分周条件設定値＝２の場合、分周クロック１サイクル分の周期は、「１７Ｔ→１５Ｔ→１７Ｔ→１５Ｔ→，１７Ｔ→１５Ｔ→１７Ｔ→１５Ｔ→，…」というパターンを繰り返す。

また、分周条件設定値＝３の場合、分周クロック１サイクル分の周期は、「１７Ｔ→１６Ｔ→１６Ｔ→１５Ｔ→，１７Ｔ→１６Ｔ→１６Ｔ→１５Ｔ→…」というパターンを繰り返す。

【００６３】

このように、分周クロック１サイクル分の周期を所定のパターンで変化させた場合、分周クロックの位相がどのように変化するかを考慮する。

分周条件設定値＝０の場合、分周クロック１サイクル分の周期は常に１６Ｔであり、１６Ｔは上述のように基準分周比である。

【００６４】

以下の説明では、分周条件設定値＝０の場合の分周クロック信号の位相を基準にして分周クロック信号の位相変化を説明する。

位相比較器４１が注目する位相は、分周クロック信号に関してはその立ち上りエッジ位相とする。

【００６５】

分周クロックは同期式ＳＲＦＦ４５５のＱ出力を反転したものなので、図４では、同期式ＳＲＦＦ４５５のＱ出力の立ち下がりエッジ位相に注目する。

分周条件設定値－１の場合、分周クロックカウンタ４６のカウント値が“０”になる分周クロックサイクル周期は１７Ｔであるから、同期式ＳＲＦＦ４５５のＱ出力の立ち下がりエッジ位相は、分周クロック基準位相に対して１Ｔ分の遅れが生じる。

【００６６】

また、分周クロックカウンタ４６のカウント値が“１”になる分周クロックサイクル周期は１５Ｔであるから、直前のサイクルの立ち下がりエッジ位相遅れと差し引きして、同期式ＳＲＦＦ４５５のＱ出力の立ち下がりエッジ位相は分周クロック基準位相と一致する。

【００６７】
さらに、分周クロックカウンタ４６のカウント値が“２”，“３”になる分周クロックサイクル周期は１６Ｔであるから、同期式ＳＲＦＦ４５５のＱ出力の立ち下がりエッジ位相は分周クロック基準位相と一致する。
【００６８】
すなわち、分周条件設定値－１の場合、分周クロック位相は分周クロック基準位相に対して、「１Ｔ遅れ → 一致 → 一致 → 一致 →…」というパターンを繰り返す。
【００６９】
そして、上述と同様にして、分周条件設定値＝２の場合、分周クロック位相は分周クロック基準位相に対して、「１Ｔ遅れ → 一致 → １Ｔ遅れ → 一致 →…」というパターンを繰り返す。
【００７０】
また、分周条件設定値＝３の場合、分周クロック位相は分周クロック基準位相に対して、「１Ｔ遅れ → １Ｔ遅れ → １Ｔ遅れ → 一致 →…」というパターンを繰り返す。
【００７１】
次に、上記のように分周クロック位相が変化した場合のウォブル信号（ＷＢＬ）位相と記録用クロック信号（ＷＣＬＫ）位相の関係について説明する。
ＰＬＬの動作時定数は、一般に位相比較周期に比べて長い周期が設定される。
そのため、上記のように分周クロック位相が変化しても、記録用クロック信号周波数は略一定の値に保たれ、定常状態においては分周クロック信号の平均的位相がウォブル信号位相に一致するようなロック状態が得られる。
【００７２】
図５は、分周条件設定値＝１の場合の定常状態でロックした状態のウォブル信号（ＷＢＬ），記録用クロック信号（ＷＣＬＫ），及び分周クロック信号のタイミングを示す図である。
【００７３】
同図の上段の（ａ）～（ｄ）には、それぞれウォブル信号（ＷＢＬ），分周クロック信号，及び分周クロックカウンタ４６のカウント値の関係を示し、下段の（ｅ）～（ｇ）には、位相比較が行なわれる立ち上りエッジ部分を拡大して、それぞれウォブル信号（ＷＢＬ），記録用クロック信号（ＷＣＬＫ），及び分周クロック信号の関係を示している。
【００７４】
上述のように、定常状態でロックした状態では分周クロック信号の平均的位相がウォブル信号位相に一致する。
その結果、ウォブル信号に対する分周クロックの位相は、図５の（ｇ）に示すように「０．７５Ｔ遅れ → ０．２５Ｔ進み → ０．２５Ｔ進み → ０．２５Ｔ進み→…」という関係になる。
【００７５】
分周条件設定値＝１の場合、分周クロックカウンタ４６のカウント値が“０”の場合の分周クロック位相のみが分周クロック基準位相に対して１Ｔ遅れていることを考えると、ウォブル信号位相に対する分周クロック基準位相は、常に“０．２５Ｔ”の進みになる。
このことは、ウォブル信号位相に対する記録用クロック信号位相が、“０．２５Ｔ”の進みになることと等価である。
【００７６】
また、図示を省略するが、上述と同様にして、分周条件設定値＝２，３の場合、ウォブル信号位相に対する記録用クロック信号位相は、それぞれ“０．５Ｔ”，“０．７５Ｔ”の進みになる。
【００７７】
このようにして、この記録クロック発生回路４では、分周条件設定値が“０”から“３”の範囲で、その値に応じてウォブル信号と記録用クロック信号との位相関係を０．２５

Ｔ単位で“０Ｔ”から“０．７５Ｔ”まで変化させることができる。

【００７８】

次に、図６のタイミング図に基づいて、この記録クロック発生回路が、ウォブル信号と記録用クロック信号との位相関係をさらに大きく変化させるときの制御について説明する。

【００７９】

図６の上段には、分周条件設定値を“３”から“０”に変化させた場合の分周器４５の動作タイミングを示している。

ここでは、分周条件設定値を“３”から“０”に変化させるタイミングを、分周クロックカウンタ４６のカウント値が“３”から“０”に変化するタイミングに一致させる。

【００８０】

分周条件設定値が“３”であり、分周クロックカウンタ４６のカウント値が“３”になる分周クロックサイクル周期は、上述の説明のように１５Ｔになる。

【００８１】

また、分周条件設定値が“０”であり、分周クロックカウンタ４６のカウント値が“０”になる分周クロックサイクル周期は、Ａカウンタ４５１の初期値が分周条件設定値が“３”であり、分周クロックカウンタ４６のカウント値が“３”の段階で設定されたものになるので１７Ｔになる。

【００８２】

同様にして、分周条件設定値が“０”であり、分周クロックカウンタ４６のカウント値が“１”，“２”，“３”になる分周クロックサイクル周期は、上述の説明のように１６Ｔになる。

【００８３】

すなわち、分周条件設定値を“３”から“０”に変化させた直後の分周クロックサイクル周期は、分周条件設定値が“０”のままの分周クロックサイクル周期と異なり、丸々１Ｔ分の周期が加えられたものになり、それ以降は、その１Ｔ分の周期加算による位相ずれが累積されたままになる。

【００８４】

そのため、分周条件設定値を“３”にし、ウォブル信号に対して記録用クロック信号の位相を０．７５Ｔ進ませた状態から、分周条件設定値を“０”に変化させた場合、ウォブル信号に対する記録用クロック信号の位相は１Ｔ進んだ状態になる。

【００８５】

この状態からさらに、分周条件設定値を“１→２→３”と変化させた場合、定常状態におけるウォブル信号に対する記録用クロック信号の位相は、「１．２５Ｔ→１．５Ｔ→１．７５Ｔ進んだ」状態になる。

【００８６】

図６の下段には、分周条件設定値を“０”から“３”に変化させた場合の分周器４５の動作タイミングを示している。

ここでは、分周条件設定値を“０”から“３”に変化させるタイミングを、分周クロックカウンタ４６のカウント値が“３”から“０”に変化するタイミングに一致させるものとする。

【００８７】

分周条件設定値が“０”であり、分周クロックカウンタ４６のカウント値が“３”になる分周クロックサイクル周期は、上述した説明のように１６Ｔになる。

【００８８】

また、分周条件設定値が“３”になり、分周クロックカウンタ４６のカウント値が“０”になる分周クロックサイクル周期は、Ａカウンタ４５１の初期値が分周条件設定値が“０”であり、分周クロックカウンタ４６のカウント値が“３”の段階で設定されたものになるので１６Ｔになる。

【００８９】

同様にして、分周条件設定値が“３”であり、分周クロックカウンタ４６のカウント値が“１”，“２”，“３”になる分周クロックサイクル周期は、上述の説明のようにそれぞれ“１６Ｔ”，“１６Ｔ”，“１５Ｔ”になる。

【００９０】

すなわち、分周条件設定値を“０”から“３”に変化させた直後の分周クロックサイクル周期は、分周条件設定値が“３”のままの分周クロックサイクル周期と異なり、丸々１Ｔ分の周期が差し引かれたものとなり、それ以降は、その１Ｔ分の周期加算による位相ずれが累積されたままになる。

【００９１】

そのため、分周条件設定値を“０”にし、ウォブル信号に対して記録用クロック信号の位相を一致させた状態から分周条件設定値を“３”に変化させた場合、ウォブル信号に対する記録用クロック信号の位相は０．２５Ｔ遅れた状態になる。

【００９２】

この状態からさらに、分周条件設定値を“２→１→０”と変化させた場合、定常状態におけるウォブル信号に対する記録用クロック信号の位相は「０．２５Ｔ→０．５Ｔ→０．７５Ｔ遅れた」状態になる。

【００９３】

このようにして、この参考例の記録クロック発生回路は、分周条件設定値が“０”から“３”の範囲で、その値に応じてウォブル信号と記録用クロック信号との位相関係を０．２５Ｔ単位で“０Ｔ”から“０．７５Ｔ”まで変化させることができるだけではなく、分周条件設定値を「３→０→１→２→３．．．」というようにバイナリカウンタ式に増加させていくか、「０→３→２→１→０．．．」というように減少させていくことにより、ウォブル信号と記録用クロック信号との位相関係を０．２５Ｔ単位で無限に変化させることができる。

【００９４】

なお、上記のこの発明の参考例の記録クロック発生回路では、分周クロックカウンタ４６のカウント長を“４”にし、分周器４５の分周比変化の繰り返しサイクルを“４”にしているので、ウォブル信号と記録用クロック信号との位相関係の設定単位が“０．２５Ｔ”になっているが、カウント長をより長くし、分周比変化の繰り返しサイクルも同じく長くすることにより、より細かい単位で位相関係の設定が可能になる。

【００９５】

次に、この発明の他の参考例の記録クロック発生回路について説明する。

この記録クロック発生回路は、図２及び図３に示したような構成と同じであり、上述と同じように図１に示した光ディスク駆動装置の記録クロック発生回路４として用いられるが、その機能が上述のものとは若干異なる。

【００９６】

この場合の記録クロック発生回路４は、図示を省略したコントローラによって光ディスク１にデータを記録する毎に記録クロック発生回路４内で設定される分周条件設定値をランダムに選択する。

【００９７】

このようにして、この記録クロック発生回路４によれば、光ディスクにデータを記録する毎に、ウォブル信号と記録用クロック信号との位相関係がランダムに変化し、光ディスクの記録領域の同じ場所を繰り返して使用することを防ぐことができ、ディスク材料の疲労を平均化して軽減し、結果的に繰り返し使用回数を向上させることができる。

【００９８】

しかも、アナログディレイ回路を使用しないで記録開始点をランダムに可変することが可能なので、装置コストを低減することができ、低価格で提供することができる。

【００９９】

次に、この発明のまた他の参考例の記録クロック発生回路について説明する。

この記録クロック発生回路は、図２及び図３に示したような構成と同じであり、上述と

同じように図１に示した光ディスク駆動装置の記録クロック発生回路４として用いられるが、その機能が上述の２つのものとは若干異なる。

【０１００】

この記録クロック発生回路は上記他の参考例と同様に図２、図６に示すような構成のもので、図１に示す光ディスク駆動装置の記録クロック発生回路４として用いられる。

【０１０１】

この場合の記録クロック発生回路４の発生した記録クロックでデータを記録する光ディスク１には、ウォブル信号にアドレス情報と同期信号とが変調されて重畳されている。

【０１０２】

この記録クロック発生回路４の同期検出回路５は、ウォブル信号に重畳された同期信号を検出し、ウォブル同期信号を出力する。

アドレスデコーダ６は、ウォブル信号に重畳されたアドレス情報を検出する。

【０１０３】

データエンコーダ８は、記録用クロック信号（ＷＣＫ）に同期させて記録データに変調を施す他に、変調データ中に同期信号を挿入する。

また、同期信号挿入のタイミングでエンコーダ同期信号を出力する。

同期判定回路１１は、ウォブル同期信号とエンコーダ同期信号とのタイミングを監視する。

【０１０４】

通常、ウォブル信号と記録用クロック信号との位相が同期した状態では、ウォブル同期信号とエンコーダ同期信号とのタイミングは一致する。

しかし、記録クロック発生回路４にビットスリップが生じた場合、ウォブル信号と記録用クロックの位相ずれが生じるので、その生じたビットスリップ分だけウォブル同期信号とエンコーダ同期信号との間にタイミング差が生じる。

【０１０５】

そこで、同期検出回路５は、ウォブル同期信号とエンコーダ同期信号との間にタイミング差が生じた場合、この差に応じて記録クロック発生回路４に設定する分周条件設定値を変化させる。

【０１０６】

図７は、図１に示した光ディスク駆動装置においてビットスリップが生じた場合の同期検出回路５の動作の説明に供する各種信号のタイミング図である。

同図に示す例では、左から２番目と３番目の同期信号の間でビットスリップが生じており、３番目のウォブル同期信号とエンコーダ同期信号との間にタイミング差を生じている。

【０１０７】

また、ビットスリップの発生により、ウォブル信号に対して記録用クロックの位相は遅れ方向に生じているので、エンコーダ同期信号の発生位置よりも早いタイミングでウォブル同期信号が生じている。

【０１０８】

このような場合、同期検出回路５は、ビットスリップによって生じた記録用クロックの位相遅れを修正するために、記録用クロック信号の位相を進める方向に分周条件設定値を変化させる。

【０１０９】

上述のように制御すると、図２と図３に示した記録クロック発生回路４では、分周条件設定値を「０→１→２→３→０→１．．．」というようにバイナリカウンタ式に増加させることにより、ウォブル信号に対する記録用クロックの位相を０．２５Ｔ単位で進めて行くことができる。

【０１１０】

また、同期検出回路５は、ウォブル同期信号とエンコーダ同期信号との間にタイミング差がなくなるまで分周条件設定値を変化させていく。

その結果、ビットスリップによって生じた記録用クロックの位相遅れを修正することができる。

【０１１１】

このようにして、この記録クロック発生回路によれば、ウォブル信号の欠落などによって記録用クロック信号がウォブル信号に対してビットスリップを生じた場合でも、ウォブル信号と記録用クロックの位相ずれを回復させることができ、記録データを所定位置に復旧させることが可能になる。

【０１１２】

次に、この発明の一実施形態の記録クロック発生回路について説明する。

図８は、この発明の一実施形態の記録クロック発生回路の構成を示すブロック図であり、図１６に示した記録クロック発生回路の構成と略同じであるが、位相比較器４１に位相比較マスク信号を入力するようにしたところが異なる。

【０１１３】

そして、この記録クロック発生回路も、図１に示した光ディスク駆動装置の記録クロック発生回路として用いられる。

また、この場合の記録クロック発生回路の発生した記録クロックでデータを記録する光ディスク１には、ウォブル信号にアドレス情報と同期信号とが位相変調されて重畳されている。

【０１１４】

図９は、位相変調されたウォブル信号の波形例を示す説明図である。

この記録クロック発生回路を用いた図１の光ディスク駆動装置では、同期検出回路５はウォブル信号に重畳された同期信号を検出すると共に、アドレス情報と同期信号が位相変調された所定タイミングの近傍では、図８に示した位相比較器４１に対して位相差検出をマスクさせるための位相比較マスク信号を出力する。

【０１１５】

図１０は、同期検出回路５が位相比較マスク信号を出力するときのタイミング例を示す説明図である。

同図に示すように、ウォブル信号に重畳された同期信号（ウォブル同期信号）を検出し、光ディスク１上の同期信号とアドレス信号（アドレス情報の検出信号）の検出区間では位相比較マスク信号を出力する。

【０１１６】

このようにして、この記録クロック発生回路によれば、位相変調によってウォブル信号の位相に急な変化が生じる部分では位相比較器４１の動作をマスクするので、ウォブル信号と記録用クロック信号との位相ずれが生じることが無くなり、ウォブル信号に安定して位相同期させた記録用クロック信号を発生させることができる。

【０１１７】

次に、この発明のさらに他の参考例の記録クロック発生回路について説明する。

図１１は、この発明のさらに他の参考例の記録クロック発生回路の構成を示すブロック図であり、図２，図８，及び図１６に示した記録クロック発生回路と共通する部分には同一符号を付している。

【０１１８】

そして、この記録クロック発生回路も、図１に示した光ディスク駆動装置の記録クロック発生回路として用いられる。

【０１１９】

この記録クロック発生回路は、周波数比較器４０１がウォブル信号を所定比で分周し、その分周されたウォブル信号の周期を記録用クロック信号の周期でカウントし、そのカウント値に応じて周波数差信号をチャージポンプ４０２へ出力し、また、切り換え信号をマルチプレクサ４０３へ出力する。

【０１２０】

チャージポンプ４０２は、周波数差信号を電圧信号に変換する。

マルチプレクサ４０３は、周波数比較器４０１からの切り換え信号に応じて、チャージポンプ４２，チャージポンプ４０２の出力の一方を選択して出力する。

【０１２１】

図１２は、図１１に示した周波数比較器４０１の内部構成を示すブロック図である。

この周波数比較器４０１のカウンタ４０１１は、ウォブル信号（ＷＢＬ）を所定比で分周し、分周ウォブルパルスをカウンタ４０１２とレジスタ４０１３へそれぞれ出力する。

【０１２２】

カウンタ４０１２は、分周クロックの数をカウントし、分周ウォブルパルス毎にリセットされる。

レジスタ４０１３には、分周ウォブルパルス毎にリセットされる直前のカウンタ４０１２のカウント値がロードされる。

【０１２３】

その結果、レジスタ４０１３には、分周されたウォブル信号の周期を記録用クロック信号の周期でカウントした値がロードされることになり、その値はウォブル信号周波数に対して分周クロック周波数が小さい時には小さい値になり、大きい時には大きい値になり、ウォブル信号周波数に対する分周クロック周波数を示す値になる。

【０１２４】

データコンパレータ４０１４は、レジスタ４０１３の値が所定値よりも大きい場合にはＤｏｗｎ信号を、小さい場合にはＵｐ信号をそれぞれ出力する。

また、データコンパレータ４０１４は、レジスタ４０１３の値が所定の範囲内にある場合には、チャージポンプ４２の出力を選択するように切り換え信号（Ｍｕｘ）をアクティブにし、所定の範囲外の場合には、チャージポンプ４０２の出力を選択するように切り換え信号（Ｍｕｘ）をインアクティブにする。

上記所定範囲の値は、ＰＬＬ回路のキャプチャレンジに相当するように選ぶ。

【０１２５】

その結果、図１１のＶＣＯ４４は、ウォブル信号周波数と記録クロック周波数との関係がキャプチャレンジ外の場合には、周波数比較器４０１から出力されるＵｐ信号又はＤｏｗｎ信号に応じてキャプチャレンジ内に近づくように駆動し、キャプチャレンジ内に入ると位相比較器４１出力に応じて駆動する。

【０１２６】

このようにして、この記録クロック発生回路によれば、ウォブル信号周波数と記録クロック周波数との関係がキャプチャレンジ外にあっても速やかにＰＬＬのロックが可能になる。

【０１２７】

次に、この発明のさらにまた他の参考例の記録クロック発生回路について説明する。

この記録クロック発生回路は、図１１に示した記録クロック発生回路の構成と同じであるが、その周波数比較器４０１の内部構成が上述のものとは異なる。そして、図１に示した光ディスク駆動装置の記録クロック発生回路として用いられる。

【０１２８】

図１３は、この発明のさらにまた他の参考例の記録クロック発生回路の周波数比較器４０１の内部構成を示すブロック図である。

この周波数比較器４０１の構成は、図１２に示したものと同様にカウンタ４０１１，カウンタ４０１２，レジスタ４０１３，及びデータコンパレータ４０１４を備えている。さらに、新たなカウンタ４０１５とフリップフロップ４０１６を設けている。

【０１２９】

この周波数比較器４０１のデータコンパレータ４０１４は、レジスタ４０１３値が所定の範囲内にある場合には切り換え信号（Ｍｕｘ）をアクティブにする。

フリップフロップ４０１６は、その切り換え信号（Ｍｕｘ）がアクティブになるとセットされ、その出力である切り換え信号（Ｍｕｘ′）をアクティブにする。

【０１３０】

データコンパレータ４０１４は、レジスタ４０１３の値が所定の範囲外の場合には、切り換え信号（Ｍｕｘ）をインアクティブにするが、切り換え信号（Ｍｕｘ′）はすぐにはインアクティブとはならない。

【０１３１】

カウンタ４０１５は、切り換え信号（Ｍｕｘ）がインアクティブの場合、分周ウォブルパルス毎にカウント値をアップさせる。

また、カウンタ４０１５は、切り換え信号（Ｍｕｘ）がアクティブの場合、分周ウォブルパルスによってカウント値をリセットする。

そして、上記カウント値が所定値に達すると、フリップフロップ４０１６に対してリセット信号を出力し、切り換え信号（Ｍｕｘ′）をインアクティブにする。

【０１３２】

こうして、レジスタ４０１３にロードされるカウント値が所定の範囲外であることが所定回数連続して検出された場合には、切り換え信号（Ｍｕｘ′）をインアクティブにする。

【０１３３】

したがって、ウォブル信号周波数と記録クロック周波数との関係がキャプチャレンジ内にあるにもかかわらず、ウォブル信号の欠落などによって周波数比較器４０１が誤ってキャプチャレンジ外であると判定することを防ぐことができる。

【０１３４】

このようにして、この記録クロック発生回路によれば、ウォブル信号周波数と記録クロック周波数との関係がキャプチャレンジ外にあっても速やかにＰＬＬのロックを可能にすると共に、ＰＬＬのロック中にウォブル信号の欠落などによって不必要な引き込み動作が生じることを防ぐことができる。

【図面の簡単な説明】

【０１３５】

【図１】この発明の参考例及びこの発明の一実施形態である光ディスク駆動装置の構成例を示すブロック図である。

【図２】図１に示したこの発明の参考例の記録クロック発生回路の内部構成例を示すブロック図である。

【図３】図２に示した分周器，分周クロックカウンタ，及び分周比設定テーブルのさらに詳細な構成例を示す図である。

【図４】図２に示した分周器の動作の説明に供する各種信号のタイミング図である。

【０１３６】

【図５】図２に示した記録クロック発生回路における分周条件設定値＝１の場合の定常状態でロックした状態のウォブル信号，記録用クロック信号，及び分周クロック信号のタイミングを示す図である。

【図６】図２に示した記録クロック発生回路におけるウォブル信号と記録用クロック信号との位相関係をさらに大きく変化させるときの制御の説明に供する各種信号のタイミング図である。

【図７】図１に示した光ディスク駆動装置においてビットスリップが生じた場合の同期検出回路の動作の説明に供する各種信号のタイミング図である。

【０１３７】

【図８】この発明の一実施形態の記録クロック発生回路の構成を示すブロック図である。

【図９】図１に示した光ディスクの位相変調されたウォブル信号の波形例を示す説明図である。

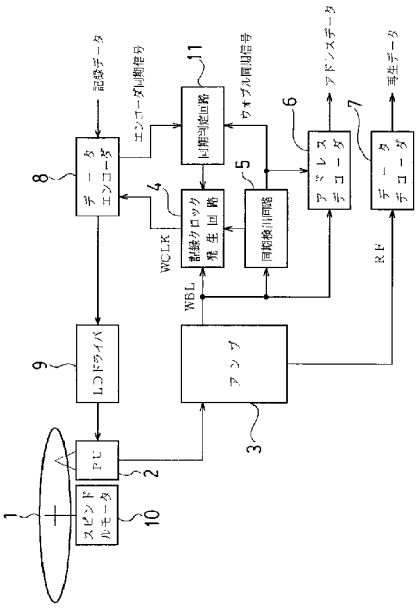
【図１０】図１に示した同期検出回路が位相比較マスク信号を出力するときのタイミング例を示す説明図である。

【図１１】この発明のさらに他の参考例の記録クロック発生回路の構成を示すブロック図である。

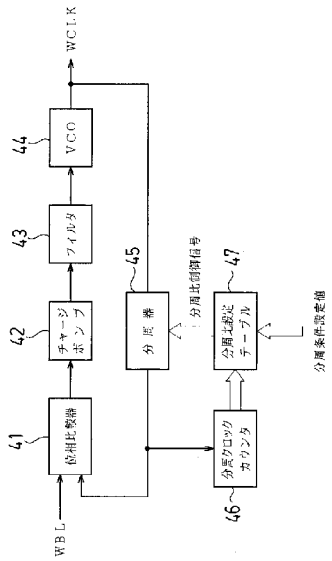
【図１２】図１１に示した周波数比較器の内部構成を示すブロック図である。

【０１３８】
【図１３】この発明のさらにまた他の参考例の周波数比較器の内部構成を示すブロック図である。
【図１４】従来の光ディスク駆動装置の構成例を示すブロック図である。
【図１５】光ディスク１上のウォブリングされたデータ記録用トラックの構造例を示す説明図である。
【図１６】図１４に示した従来の記録クロック発生回路の構成例を示すブロック図である。
【符号の説明】
【０１３９】
１：光ディスク　２：光ピックアップ（ＰＵ）　３：アンプ　４：記録クロック発生回路　５：同期検出回路　６：アドレスデコーダ　７：データデコーダ　８：データエンコーダ　９：ＬＤドライバ　１０：スピンドルモータ　１１：同期判定回路　４１：位相比較器　４２，４０２：チャージポンプ　４３：フィルタ　４４：ＶＣＯ　４５：分周器　４６：分周クロックカウンタ　４７：分周比設定テーブル　４５１：Ａカウンタ　４５２：Ｂカウンタ　４５３：インバータ　４０３，４５４：マルチプレクサ　４５５：同期式ＳＲＦＦ　４０１：周波数比較器　４０１１，４０１２，４０１５：カウンタ　４０１３：レジスタ　４０１４：データコンパレータ　４０１６：フリップフロップ

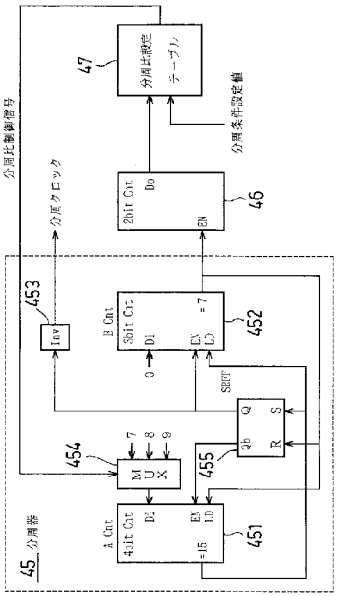
【図１】



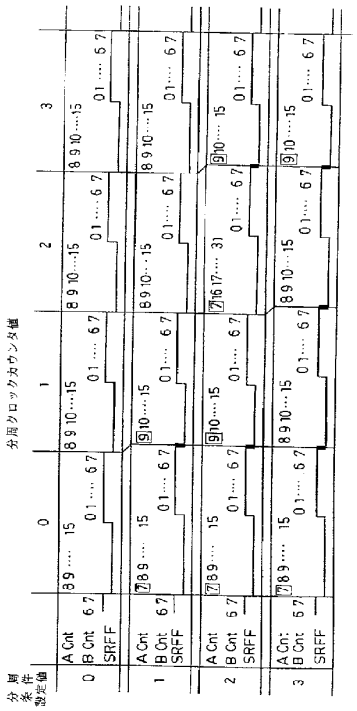

【図２】



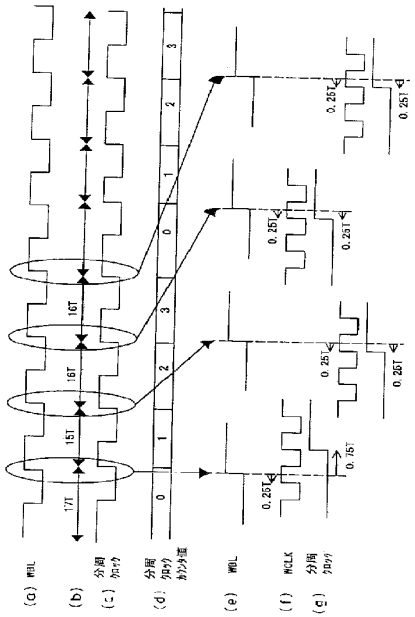
【図３】


分周比制御信号
分周クロック
47
分周比設定
テーブル
分周条件設定値
2bit Cnt
Do
46
453
Inv
B Cnt
Shift Cnt
Di
=7
452
454
M
U
X
455
Q
Qb
R
S
SHIFT
A Cnt
4bit Cnt
Di
=15
451
45 分周器

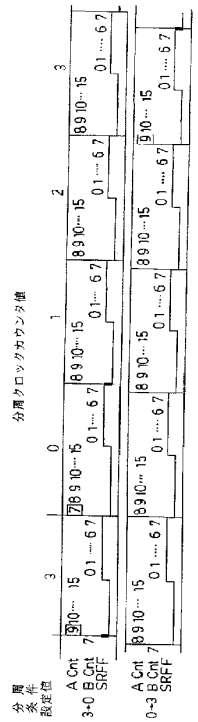
【図４】


分周クロックカウント値
分周条件設定値
A Cnt
B Cnt
SRFF

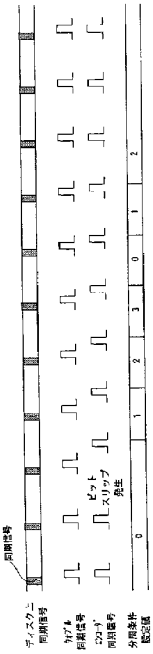
【図５】


(a) MCL
(b) 分周クロック
(c) 分周クロックカウント値
(d) MCL
(e) MCLK
(f) 分周クロック
(g)
16T
15T
0.25T
0.75T

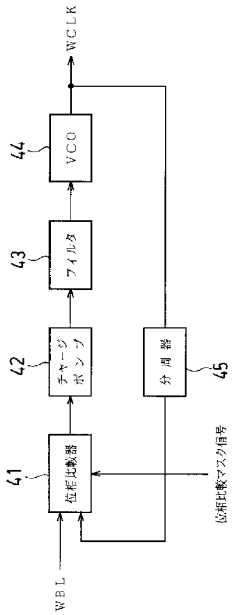
【図６】


分周クロックカウント値
分周条件設定値
A Cnt
B Cnt
SRFF
3-0
0-3

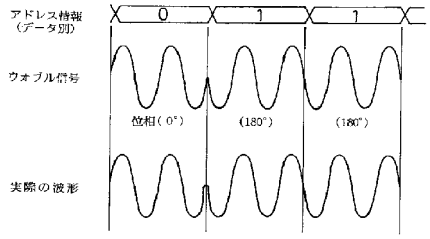
【図７】


同期信号
ディスク上同期信号
ウォブル同期信号
ビット スリップ 発生
分周条件設定値

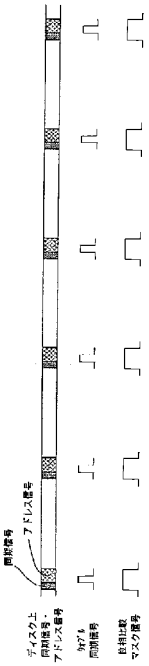
【図８】


WCLK
VCO
フィルタ
チャージ ポンプ
位相比較器
分周器
位相比較マスク信号
WBL
41
42
43
44
45

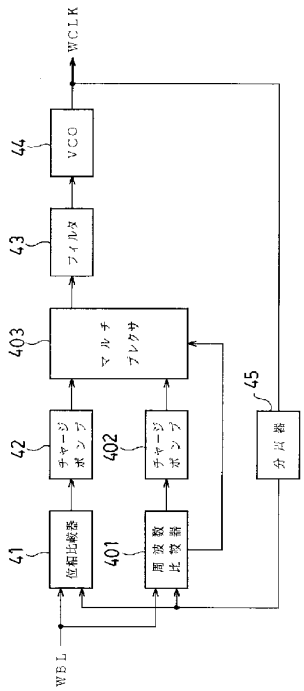
【図９】


アドレス情報 (データ列)
0
1
1
ウォブル信号
位相(0°)
(180°)
(180°)
実際の波形

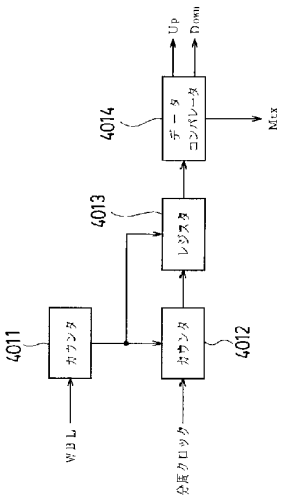
【図１０】


同期信号
アドレス信号
ディスク上同期信号、アドレス信号
ウォブル同期信号
位相比較マスク信号

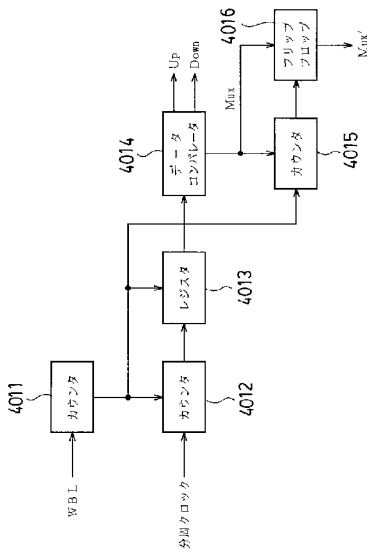
【図１１】



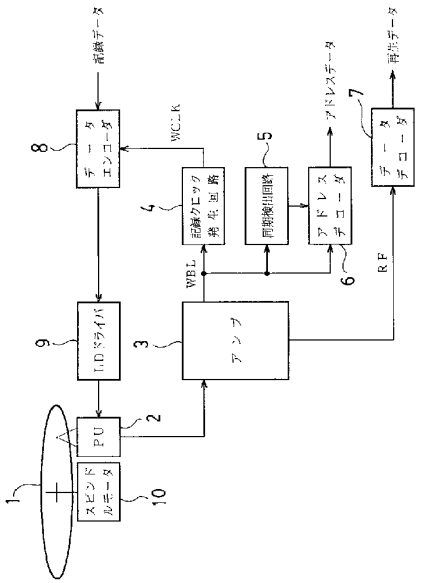

【図１２】



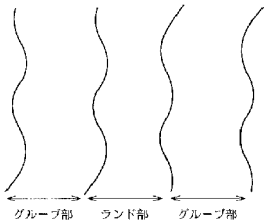

【図１３】



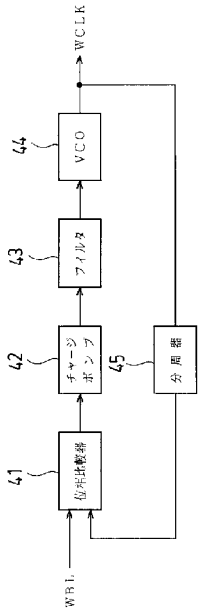

【図１４】



【図１５】


グルーブ部
ランド部
グルーブ部

【図１６】


WCLK
44
VCO
43
フィルタ
42
チャージポンプ
45
分周器
41
位相比較器
WBL

# PATENT ABSTRACTS OF JAPAN

(11)Publication number : **2005-108427**
(43)Date of publication of application : **21.04.2005**

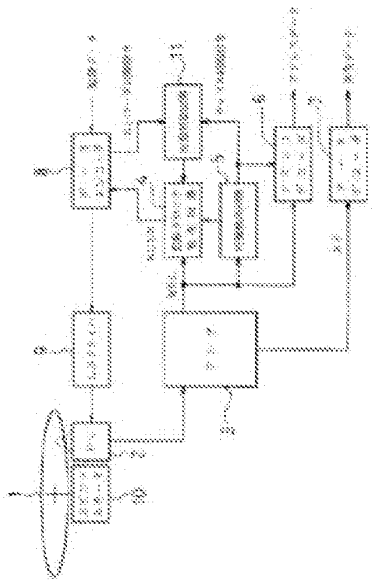
(51)Int.Cl. **G11B 20/14**
**G11B 7/0045**
**G11B 7/005**

(21)Application number : **2004-355032**
(22)Date of filing : **08.12.2004**

(71)Applicant : **RICOH CO LTD**
(72)Inventor : **SHIGEMORI TOSHIHIRO**

## (54) DATA RECORDING CLOCK SIGNAL GENERATOR

(57)Abstract:
PROBLEM TO BE SOLVED: To generate a recording clock stably synchronized in phase with a wobbling signal even in an optical disk in which address information is superimposed on a wobbling signal by phase modulation.
SOLUTION: A recording clock generator circuit 4 extracts a wobbling signal, generates a frequency-divided signal obtained by frequency-dividing a recording clock signal, generates a phase difference signal by comparing phases between the wobbling signal and the frequency-divided signal, generates a frequency control signal based on the phase difference signal, and also generates the recording clock signal having a frequency controlled based on the frequency control signal. Thus, no phase difference signal is generated near the predetermined timing in which the address information or the synchronous signal of an optical disk is phase-modulated.



**PATENT COOPERATION TREATY**

# PCT

**INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY**
(Chapter I of the Patent Cooperation Treaty)

(PCT Rule 44*bis*)

| | | |
|---|---|---|
| Applicant's or agent's file reference<br>13-0410-PCT | **FOR FURTHER ACTION** | See item 4 below |
| International application No.<br>PCT/US2013/046372 | International filing date *(day/month/year)*<br>18 June 2013 (18.06.2013) | Priority date *(day/month/year)*<br>26 June 2012 (26.06.2012) |
| International Patent Classification (8th edition unless older edition indicated)<br>See relevant information in Form PCT/ISA/237 | | |
| Applicant<br>SONOS, INC. | | |

1. This international preliminary report on patentability (Chapter I) is issued by the International Bureau on behalf of the International Searching Authority under Rule 44 *bis*.1(a).

2. This REPORT consists of a total of 5 sheets, including this cover sheet.

   In the attached sheets, any reference to the written opinion of the International Searching Authority should be read as a reference to the international preliminary report on patentability (Chapter I) instead.

3. This report contains indications relating to the following items:

| | | |
|---|---|---|
| ☒ | Box No. I | Basis of the report |
| ☐ | Box No. II | Priority |
| ☐ | Box No. III | Non-establishment of opinion with regard to novelty, inventive step and industrial applicability |
| ☐ | Box No. IV | Lack of unity of invention |
| ☒ | Box No. V | Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement |
| ☐ | Box No. VI | Certain documents cited |
| ☐ | Box No. VII | Certain defects in the international application |
| ☐ | Box No. VIII | Certain observations on the international application |

4. The International Bureau will communicate this report to designated Offices in accordance with Rules 44*bis*.3(c) and 93*bis*.1 but not, except where the applicant makes an express request under Article 23(2), before the expiration of 30 months from the priority date (Rule 44*bis* .2).

| | |
|---|---|
| | Date of issuance of this report<br>31 December 2014 (31.12.2014) |
| The International Bureau of WIPO<br>34, chemin des Colombettes<br>1211 Geneva 20, Switzerland<br>Facsimile No. +41 22 338 82 70 | Authorized officer<br>Simin Baharlou<br>e-mail: pt09.pct@wipo.int |

Form PCT/IB/373 (January 2004)

# PATENT COOPERATION TREATY

From the
INTERNATIONAL SEARCHING AUTHORITY

To:
GEORGE CHRISTOPHER N.

HANLEY, FLIGHT & ZIMMERMAN, LLC 150 S.
WACKER DRIVE SUITE 2100 CHICAGO IL 60606 USA

# PCT

**WRITTEN OPINION OF THE INTERNATIONAL SEARCHING AUTHORITY**

**(PCT Rule 43bis.1)**

| | |
|---|---|
| Date of mailing *(day/month/year)* | **26 August 2013 (26.08.2013)** |
| Applicant's or agent's file reference<br>13-0410-PCT | **FOR FURTHER ACTION**<br>See paragraph 2 below |

| International application No. | International filing date *(day/month/year)* | Priority date *(day/month/year)* |
|---|---|---|
| **PCT/US2013/046372** | **18 June 2013 (18.06.2013)** | 26 June 2012 (26.06.2012) |

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

***G06F 15/16(2006.01)i***

Applicant

**SONOS, INC.**

1. This opinion contains indications relating to the following items:

- ☒ Box No. I Basis of the opinion
- ☐ Box No. II Priority
- ☐ Box No. III Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
- ☐ Box No. IV Lack of unity of invention
- ☒ Box No. V Reasoned statement under Rule 43bis.1(a)(i) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
- ☐ Box No. VI Certain documents cited
- ☐ Box No. VII Certain defects in the international application
- ☐ Box No. VIII Certain observations on the international application

2. **FURTHER ACTION**

If a demand for international preliminary examination is made, this opinion will be considered to be a written opinion of the International Preliminary Examining Authority ("IPEA") except that this does not apply where the applicant chooses an Authority other than this one to be the IPEA and the chosen IPEA has notified the International Bureau under Rule 66.1bis(b) that written opinions of this International Searching Authority will not be so considered.

If this opinion is, as provided above, considered to be a written opinion of the IPEA, the applicant is invited to submit to the IPEA a written reply together, where appropriate, with amendments, before the expiration of 3 months from the date of mailing of Form PCT/ISA/220 or before the expiration of 22 months from the priority date, whichever expires later.
For further options, see Form PCT/ISA/220.

| Name and mailing address of the ISA/KR | Date of completion of this opinion | Authorized officer |
|---|---|---|
| Korean Intellectual Property Office<br>189 Cheongsa-ro, Seo-gu, Daejeon Metropolitan City, 302-701, Republic of Korea<br>Facsimile No. +82-42-472-7140 | 23 August 2013 (23.08.2013) | PARK, Sang Hyun<br>Telephone No. +82-42-481-8263 |

Form PCT/ISA/237 (cover sheet) (July 2011)

**WRITTEN OPINION OF THE INTERNATIONAL SEARCHING AUTHORITY**

International application No.
**PCT/US2013/046372**

**Box No. I Basis of this opinion**

1. With regard to the **language**, this opinion has been established on the basis of :

   ☒ the international application in the language in which it was filed

   ☐ a translation of the international application into _____, which is the language of a translation furnished for the purposes of international search (Rules 12.3(a) and 23.1(b))

2. ☐ This opinion has been established taking into account the **rectification of an obvious mistake** authorized by or notified to this Authority under Rule 91 (Rule 43*bis*.1(a))

3. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, this opinion has been established on the basis of:

   a. a sequence listing filed or furnished
      ☐ on paper
      ☐ in electronic form

   b. time of filing or furnishing
      ☐ contained in the international application as filed.
      ☐ filed together with the international application in electronic form.
      ☐ furnished subsequently to this Authority for the purposes of search.

4. ☐ In addition, in the case that more than one version or copy of a sequence listing has been filed or furnished, the required statements that the information in the subsequent or additioanl copies is identical to that in the application as filed or does not go beyond the application as filed, as appropriate, were furnished.

5. Additional comments:

**WRITTEN OPINION OF THE INTERNATIONAL SEARCHING AUTHORITY**

International application No.
**PCT/US2013/046372**

**Box No. V Reasoned statement under Rule 43bis.1(a)(i) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement**

1. Statement

| | | | |
|---|---|---|---|
| Novelty (N) | Claims | 2-3,12-13 | YES |
| | Claims | 1,4-11,14-20 | NO |
| Inventive step (IS) | Claims | 2-3,12-13 | YES |
| | Claims | 1,4-11,14-20 | NO |
| Industrial applicability (IA) | Claims | 1-20 | YES |
| | Claims | NONE | NO |

2. Citations and explanations :

(1) Reference is made to the following documents:

D1: US 2007-0048713 A1 (DANIEL PLASTINA et al.) 01 March 2007
D2: US 2012-0030366 A1 (COLLART TODD et al.) 02 February 2012
D3: US 2006-0143236 A1 (MICHAEL WU) 29 June 2006
D4: US 2008-0091771 A1 (JEFFREY L. ALLEN et al.) 17 April 2008

(2) Novelty & Inventive Steps

Concerning claims 1-10:
Claims 1,4-10
D1 discloses a community media playlist sharing system, wherein system users can upload media playlists which are automatically converted to a standardized format, media playlists can be shared with other users of the community media playlist sharing system, users can link to other playlists and obtain media from playlists automatically from third party points of purchase, users can provide recommendations, ratings and rankings relative to other playlists by system users and receive recommendations from other users and an editorial staff, participate in social networking functions including forums, discussions, weblogs, playlist topic groups and inter-user communications based on affinity for similar playlists, create playlists manually, automatically, or in real time, and wherein system users can obtain points for participation and popularity in the system and obtain profit by meta-affiliate sharing of profit for purchases of music made through playlists submitted by that user as well as through playlist toolbars distributed to third party websites.[ paragraph 73 - paragraph 156, and figures 1-23] As all of the features of claims 1,4-10 are disclosed in D1, these claims are anticipated in D1. Therefore, claims 1,4-10 lack novelty under PCT Article 33(2) and are not considered as involving an inventive step under PCT Article 33(3).
Claims 2-3:
The subject matter of claims 2-3 is different from that of D1 in a guest mode. And it is

Continued on Supplemental Box

**Supplemental Box**

In case **the space in any of the preceding boxes is not sufficient.**
Continuation of : Box No. V

not obvious to a person skilled in the art by the documents, taken alone or in combination. Therefore, claims 2-3 are novel and involve an inventive step under PCT Article 33(2) and (3).

Concerning claims 11-20:
Claims 11,14-20:
D1 discloses a community media playlist sharing system, wherein system users can upload media playlists which are automatically converted to a standardized format, media playlists can be shared with other users of the community media playlist sharing system, users can link to other playlists and obtain media from playlists automatically from third party points of purchase, users can provide recommendations, ratings and rankings relative to other playlists by system users and receive recommendations from other users and an editorial staff, participate in social networking functions including forums, discussions, weblogs, playlist topic groups and inter-user communications based on affinity for similar playlists, create playlists manually, automatically, or in real time, and wherein system users can obtain points for participation and popularity in the system and obtain profit by meta-affiliate sharing of profit for purchases of music made through playlists submitted by that user as well as through playlist toolbars distributed to third party websites.[ paragraph 73 - paragraph 156, and figures 1-23] As all of the features of claims 11,14-20 are disclosed in D1, these claims are anticipated in D1. Therefore, claims 11,14-20 lack novelty under PCT Article 33(2) and are not considered as involving an inventive step under PCT Article 33(3).
Claims 12-13:
The subject matter of claims 12-13 is different from that of D1 in a guest mode. And it is not obvious to a person skilled in the art by the documents, taken alone or in combination. Therefore, claims 12-13 are novel and involve an inventive step under PCT Article 33(2) and (3).

(3) Industrial Applicability

The subject matter of claims 1-20 is believed to be industrially applicable under PCT Article 33(4) because the claimed invention can be used in the computer industry.

# PATENT COOPERATION TREATY

From the INTERNATIONAL BUREAU

# PCT

NOTIFICATION CONCERNING TRANSMITTAL OF COPY OF INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY (CHAPTER I OF THE PATENT COOPERATION TREATY)
(PCT Rule 44bis.1(c))

To:

JASPER, Joseph, T.
Hanley, Flight & Zimmerman, LLC
150 S. Wacker Drive, Suite 2100
Chicago, Illinois 60606
ETATS-UNIS D'AMERIQUE

| Date of mailing *(day/month/year)* | |
|---|---|
| 08 January 2015 (08.01.2015) | |
| Applicant's or agent's file reference<br>12-0402-PCT | **IMPORTANT NOTICE** |

| International application No. | International filing date *(day/month/year)* | Priority date *(day/month/year)* |
|---|---|---|
| PCT/US2013/046386 | 18 June 2013 (18.06.2013) | 26 June 2012 (26.06.2012) |

Applicant
SONOS, INC.

The International Bureau transmits herewith a copy of the international preliminary report on patentability (Chapter I of the Patent Cooperation Treaty)

| The International Bureau of WIPO<br>34, chemin des Colombettes<br>1211 Geneva 20, Switzerland | Authorized officer<br>Philippe Bécamel |
|---|---|
| Facsimile No. +41 22 338 82 70 | e-mail: pt03.pct@wipo.int |

Form PCT/IB/326 (January 2004)

**PATENT COOPERATION TREATY**

# PCT

**INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY**
(Chapter I of the Patent Cooperation Treaty)

(PCT Rule 44*bis*)

| | | |
|---|---|---|
| Applicant's or agent's file reference<br>12-0402-PCT | **FOR FURTHER ACTION** | See item 4 below |
| International application No.<br>PCT/US2013/046386 | International filing date *(day/month/year)*<br>18 June 2013 (18.06.2013) | Priority date *(day/month/year)*<br>26 June 2012 (26.06.2012) |
| International Patent Classification (8th edition unless older edition indicated)<br>See relevant information in Form PCT/ISA/237 | | |
| Applicant<br>SONOS, INC. | | |

1. This international preliminary report on patentability (Chapter I) is issued by the International Bureau on behalf of the International Searching Authority under Rule 44 *bis*.1(a).

2. This REPORT consists of a total of 7 sheets, including this cover sheet.

   In the attached sheets, any reference to the written opinion of the International Searching Authority should be read as a reference to the international preliminary report on patentability (Chapter I) instead.

3. This report contains indications relating to the following items:

| | | |
|---|---|---|
| ☒ | Box No. I | Basis of the report |
| ☐ | Box No. II | Priority |
| ☐ | Box No. III | Non-establishment of opinion with regard to novelty, inventive step and industrial applicability |
| ☐ | Box No. IV | Lack of unity of invention |
| ☒ | Box No. V | Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement |
| ☐ | Box No. VI | Certain documents cited |
| ☐ | Box No. VII | Certain defects in the international application |
| ☐ | Box No. VIII | Certain observations on the international application |

4. The International Bureau will communicate this report to designated Offices in accordance with Rules 44*bis*.3(c) and 93*bis*.1 but not, except where the applicant makes an express request under Article 23(2), before the expiration of 30 months from the priority date (Rule 44*bis* .2).

| | |
|---|---|
| | Date of issuance of this report<br>31 December 2014 (31.12.2014) |
| The International Bureau of WIPO<br>34, chemin des Colombettes<br>1211 Geneva 20, Switzerland<br>Facsimile No. +41 22 338 82 70 | Authorized officer<br>Philippe Bécamel<br>e-mail: pt03.pct@wipo.int |

Form PCT/IB/373 (January 2004)

# PATENT COOPERATION TREATY

From the
INTERNATIONAL SEARCHING AUTHORITY

To:
JASPER JOSEPH T.

HANLEY, FLIGHT & ZIMMERMAN, LLC 150 S.
WACKER DRIVE, SUITE 2100 CHICAGO IL 60606 USA

# PCT

**WRITTEN OPINION OF THE INTERNATIONAL SEARCHING AUTHORITY**

**(PCT Rule 43bis.1)**

| | |
|---|---|
| Date of mailing *(day/month/year)* | **30 September 2013 (30.09.2013)** |
| Applicant's or agent's file reference: 12-0402-PCT | **FOR FURTHER ACTION** See paragraph 2 below |

| International application No. | International filing date *(day/month/year)* | Priority date *(day/month/year)* |
|---|---|---|
| **PCT/US2013/046386** | **18 June 2013 (18.06.2013)** | 26 June 2012 (26.06.2012) |

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

***G06Q 50/10(2012.01)i***

Applicant

**SONOS, INC.**

1. This opinion contains indications relating to the following items:

- [x] Box No. I Basis of the opinion
- [ ] Box No. II Priority
- [ ] Box No. III Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
- [ ] Box No. IV Lack of unity of invention
- [x] Box No. V Reasoned statement under Rule 43bis.1(a)(i) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
- [ ] Box No. VI Certain documents cited
- [ ] Box No. VII Certain defects in the international application
- [ ] Box No. VIII Certain observations on the international application

2. **FURTHER ACTION**

If a demand for international preliminary examination is made, this opinion will be considered to be a written opinion of the International Preliminary Examining Authority ("IPEA") except that this does not apply where the applicant chooses an Authority other than this one to be the IPEA and the chosen IPEA has notified the International Bureau under Rule 66.1bis(b) that written opinions of this International Searching Authority will not be so considered.

If this opinion is, as provided above, considered to be a written opinion of the IPEA, the applicant is invited to submit to the IPEA a written reply together, where appropriate, with amendments, before the expiration of 3 months from the date of mailing of Form PCT/ISA/220 or before the expiration of 22 months from the priority date, whichever expires later.
For further options, see Form PCT/ISA/220.

| Name and mailing address of the ISA/KR | Date of completion of this opinion | Authorized officer |
|---|---|---|
| Korean Intellectual Property Office<br>189 Cheongsa-ro, Seo-gu, Daejeon Metropolitan City, 302-701, Republic of Korea<br>Facsimile No. +82-42-472-7140 | 27 September 2013 (27.09.2013) | KIM Sung Gon<br>Telephone No. +82-42-481-8746 |

Form PCT/ISA/237 (cover sheet) (July 2011)

**WRITTEN OPINION OF THE INTERNATIONAL SEARCHING AUTHORITY**

International application No.
**PCT/US2013/046386**

**Box No. I Basis of this opinion**

1. With regard to the **language**, this opinion has been established on the basis of :

   ☒ the international application in the language in which it was filed

   ☐ a translation of the international application into _____, which is the language of a translation furnished for the purposes of international search (Rules 12.3(a) and 23.1(b))

2. ☐ This opinion has been established taking into account the **rectification of an obvious mistake** authorized by or notified to this Authority under Rule 91 (Rule 43*bis*.1(a))

3. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, this opinion has been established on the basis of:

   a. a sequence listing filed or furnished
      ☐ on paper
      ☐ in electronic form

   b. time of filing or furnishing
      ☐ contained in the international application as filed.
      ☐ filed together with the international application in electronic form.
      ☐ furnished subsequently to this Authority for the purposes of search.

4. ☐ In addition, in the case that more than one version or copy of a sequence listing has been filed or furnished, the required statements that the information in the subsequent or additioanl copies is identical to that in the application as filed or does not go beyond the application as filed, as appropriate, were furnished.

5. Additional comments:

**WRITTEN OPINION OF THE INTERNATIONAL SEARCHING AUTHORITY**

International application No.
**PCT/US2013/046386**

**Box No. V Reasoned statement under Rule 43bis.1(a)(i) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement**

1. Statement

| | | | |
|---|---|---|---|
| Novelty (N) | Claims | 1-21 | YES |
| | Claims | NONE | NO |
| Inventive step (IS) | Claims | NONE | YES |
| | Claims | 1-21 | NO |
| Industrial applicability (IA) | Claims | 1-21 | YES |
| | Claims | NONE | NO |

2. Citations and explanations :

Reference is made to the following documents:

D1: US 7483958 B1 (TAREK Z. ELABBADY et al.) 27 January 2009
D2: US 2010-0228740 A1 (ALAN CANNISTRARO et al.) 09 September 2010

1. Novelty and Inventive Step

**1.1 Claims 1-10**

1.1.1 Independent claim 1

D1, which is considered to be the closest prior art to the subject matter of claim 1, discloses a method comprising: presenting media content information (e.g., music file, a play list) to the user, determining whether an original media playing license associated with the particular media contents file is available, generating a temporary media playing license from the original media playing license, the temporary media playing license specifying restrictions relating to playback of the particular media content file via the home network device; and sending the temporary media playing license to the home network device (See abstract, column 11, lines 1-20, claim 1, figure 4 in D1). Claim 1 differs from D1 in facilitating addition of content to the playlist by at least one participating user; and playback of content from the playlist in the restricted playback mode. However, D2 discloses a method comprising: receiving from at least one of the plurality of user devices a vote on a media item; and organizing the playlist based on the received votes (See abstract, paragraphs [0047]-[0057], claim 1, figure 4 in D2). Accordingly, claim 1 would have been obvious over D1 and D2. Therefore, claim 1 lacks an inventive step under PCT Article 33(3).

Continued on Supplemental Box

**Supplemental Box**

In case **the space in any of the preceding boxes is not sufficient.**
Continuation of : Box No. V

1.1.2 Dependent claims 2-10

The additional feature of claim 2 is identical to the feature of D1 in that media items in the playlist are automatically chosen and added to the playlist by a program on the playlist host device (See claim 6 in D1). Accordingly, claim 2 would have been obvious over D1 and D2. Therefore, claim 2 lacks an inventive step under PCT Article 33(3).

Claim 3 further specifies authenticating the at least one participating user to enable the at least one participating user to add content to the playlist in the restricted playback mode. However, the additional feature of claim 3 is virtually suggested by the feature of D2 considering that the host receives an opt-in command from an authorized user and the opt-in command instructs the host to allow remote access to the playlist (See abstract, paragraphs [0047]-[0057], figure 4 in D2). Accordingly, claim 3 would have been obvious over D1 and D2. Therefore, claim 3 lacks an inventive step under PCT Article 33(3).

The additional feature of claim 4 is identical to the feature of D2 in receiving from at least one of the plurality of user devices a vote on a media item; and organizing the playlist based on the received votes (See abstract, paragraphs [0047]-[0057], claim 1, figure 4 in D2). Accordingly, claim 4 would have been obvious over D1 and D2. Therefore, claim 4 lacks an inventive step under PCT Article 33(3).

Claims 5, 6 further specify that facilitating addition of content comprises accepting user selection of the content from a list of available content via a graphical user interface, and the list of available content includes a library of shared music available via a network. However, the additional features of claims 5, 6 are virtually suggested by the feature of D1 considering presenting media content information (e.g., metadata from the media library) to the user through a display screen, and selecting one or more music files, a play list, or other grouping of music files by the user (See abstract, column 11, lines 1-20, claim 1, figure 4 in D1). And D2 discloses a step of sending a playlist on a host device to a plurality of portable devices for display on a graphical user interface (See paragraph [0009] in D2). Accordingly, claims 5, 6 would have been obvious over D1 and D2. Therefore, claims 5, 6 lack an inventive step under PCT Article 33(3).

Claim 7 further comprises that the restricted playback mode is initiated and ended by a host user according to user authorization. However, the additional feature of claim 7 is merely a

Continued on The Next Page

Supplemental Box

In case **the space in any of the preceding boxes is not sufficient.**
Continuation of : Previous Page

matter of design option when the general knowledge in relevant field of the art is used. Accordingly, claim 7 would have been obvious over D1 and D2. Therefore, claim 7 lacks an inventive step under PCT Article 33(3).

Claim 8 further specifies configuring the restricted playback mode for a fixed time interval. However, the additional feature of claim 8 is virtually suggested by the feature of D2 considering ordering changes can be postponed until the interval since the last touch event has exceeded 2 seconds (See paragraph [0089] in D2). Accordingly, claim 8 would have been obvious over D1 and D2. Therefore, claim 8 lacks an inventive step under PCT Article 33(3).

Claim 9 further specifies that a restricted playback mode includes a specified configuration of zones. However, the additional feature of claim 9 is virtually suggested by the feature of D1 considering that the media content license may be associated with a specific entity or with multiple entities (e.g., groups) (See column 7, lines 61-66 in D1). Accordingly, claim 9 would have been obvious over D1 and D2. Therefore, claim 9 lacks an inventive step under PCT Article 33(3).

Claim 10 further comprises that the subset of playback functions includes limited user interaction with at least one of zone configuration and content playback parameters. However, the additional feature of claim 10 is merely a matter of design option when the general knowledge in relevant field of the art is used. Accordingly, claim 10 would have been obvious over D1 and D2. Therefore, claim 10 lacks an inventive step under PCT Article 33(3).

**1.2 Claims 11-20**

1.2.1 Independent claim 11

Claim 11 relates to a tangible computer readable storage medium including instructions which, when executed by a processor, are to implement at least a method. But it shares similar technical features with claim 1. Accordingly, the same reasoning applies to claim 11. Therefore, claim 11 lacks an inventive step under PCT Article 33(3).

1.2.2 Dependent claims 12-20

Claims 12-20 share the same technical features with claims 2-10, respectively. Accordingly, the

Continued on The Next Page

**Supplemental Box**

In case **the space in any of the preceding boxes is not sufficient.**
Continuation of : Previous Page

same reasoning applies to claims 12-20. Therefore, claims 12-20 lack an inventive step under PCT Article 33(3).

**1.3 Independent claim 21**

Claim 21 relates to a media playback system, but it shares similar technical features with claim 1. Accordingly, the same reasoning applies to claim 21. Therefore, claim 21 lacks an inventive step under PCT Article 33(3).

2. Industrial Applicability

Claims 1-21 are industrially applicable under PCT Article 33(4).

PTO/SB/08a (01-10)
Approved for use through 07/31/2012. OMB 0651-0031
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE

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**INFORMATION DISCLOSURE STATEMENT BY APPLICANT**
**( Not for submission under 37 CFR 1.99)**

| | |
|---|---|
| Application Number | 13864248 |
| Filing Date | 2013-04-17 |
| First Named Inventor | NICHOLAS; A. J. Millington |
| Art Unit | 2442 |
| Examiner Name | SURVILLO, OLEG |
| Attorney Docket Number | SNS-71301US10(13-0401) |

**U.S.PATENTS** Remove

| Examiner Initial* | Cite No | Patent Number | Kind Code[1] | Issue Date | Name of Patentee or Applicant of cited Document | Pages,Columns,Lines where Relevant Passages or Relevant Figures Appear |
|---|---|---|---|---|---|---|
| | 1 | 7483538 | | 2009-01-27 | MCCARTY; William A. et al. | |
| | 2 | 7519667 | | 2009-04-14 | CAPPS; Stephen P. | |
| | 3 | 7606174 | | 2009-10-20 | OCHI; Mitsunori et al. | |
| | 4 | 7853341 | | 2010-12-14 | MCCARTY; William A. et al. | |
| | 5 | 7996588 | | 2011-08-09 | SUBBIAH; Baranitharan et al. | |
| | 6 | 8473844 | | 2013-06-25 | KREIFELDT; Richard A. et al. | |

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| INFORMATION DISCLOSURE STATEMENT BY APPLICANT ( Not for submission under 37 CFR 1.99) | | |
|---|---|---|
| | Application Number | 13864248 |
| | Filing Date | 2013-04-17 |
| | First Named Inventor | NICHOLAS; A. J. Millington |
| | Art Unit | 2442 |
| | Examiner Name | SURVILLO, OLEG |
| | Attorney Docket Number | SNS-71301US10(13-0401) |

| | | | | | | |
|---|---|---|---|---|---|---|
| | 1 | 20020177411 | | 2002-11-28 | YAJIMA; Kiyoshi et al. | |
| | 2 | 20030061428 | | 2003-03-27 | GARNEY I; John et al. | |
| | 3 | 20030110329 | | 2003-06-12 | HIGAKI; Nobuo et al. | |
| | 4 | 20040093096 | | 2004-05-13 | HUANG; Steve Lan-Ping et al. | |
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| | 7 | 20040148237 | | 2004-07-29 | BITTMANN; Ran et al. | |
| | 8 | 20050011388 | | 2005-01-20 | KOUZNETSOV; Alex A. | |
| | 9 | 20050027821 | | 2005-02-03 | ALEXANDER; Justin et al. | |
| | 10 | 20050120128 | | 2005-06-02 | WILLES; W. P. et al. | |
| | 11 | 20050195823 | | 2005-09-08 | CHEN; Jian-Rong et al. | |

| INFORMATION DISCLOSURE STATEMENT BY APPLICANT ( Not for submission under 37 CFR 1.99) | | |
|---|---|---|
| | Application Number | 13864248 |
| | Filing Date | 2013-04-17 |
| | First Named Inventor | NICHOLAS; A. J. Millington |
| | Art Unit | 2442 |
| | Examiner Name | SURVILLO, OLEG |
| | Attorney Docket Number | SNS-71301US10(13-0401) |

| | | | | | | |
|---|---|---|---|---|---|---|
| | 12 | 20070047712 | | 2007-03-01 | GROSS; Kevin P. et al. | |
| | 13 | 20070249295 | | 2007-10-25 | UKITA; Yoshitaka et al. | |

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|---|---|---|---|
| | 1 | "Advisory Action mailed on 12 November 2014, issued in connection with U.S. Patent Application No. 13/907666, filed on 31 May 2013, 6 pages". | ☐ |
| | 2 | "Advisory Action mailed on 26 November 2014, issued in connection with U.S. Patent Application No. 14/186850, filed on 21 February 2014, 9 pages". | ☐ |
| | 3 | "Advisory Action mailed on 8 January 2015, issued in connection with U.S. Patent Application Serial No. 13/705,176, filed on 5 December 2012, 4 pages". | ☐ |
| | 4 | "Crown PIP Manual available for sale at least 2004, 68 pages". | ☐ |

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|---|---|---|
| | Application Number | 13864248 |
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| | Art Unit | 2442 |
| | Examiner Name | SURVILLO, OLEG |
| | Attorney Docket Number | SNS-71301US10(13-0401) |

| | | | |
|---|---|---|---|
| | 5 | "Final Office Action mailed on 17 December 2014, issued in connection with U.S. Patent Application No. 13/533105, filed on 26 June 2012, 36 pages". | ☐ |
| | 6 | "Final Office Action mailed on 3 December 2014, issued in connection with U.S. Patent Application No. 14/184528, filed on 19 February 2014, 12 pages". | ☐ |
| | 7 | "Final Office Action mailed on 7 January 2015, issued in connection with U.S. Patent Application Serial No. 13/848932, filed on 22 March 2013, 14 pages". | ☐ |
| | 8 | "Non-Final Office Action mailed on 1 December 2014, issued in connection with U.S. Patent Application No. 14/516867, filed on 17 October 2014, 11 pages". | ☐ |
| | 9 | "Non-Final Office Action mailed on 17 November 2014, issued in connection with U.S. Patent Application No. 13/864247, filed on 17 April 2013, 11 pages". | ☐ |
| | 10 | "Non-Final Office Action mailed on 18 November 2014, issued in connection with U.S. Patent Application No. 13/435739, filed on 30 March 2012, 10 pages". | ☐ |
| | 11 | "Non-Final Office Action mailed on 19 November 2014, issued in connection with U.S. Patent Application No. 13/848921, filed on 22 March 2013, 9 pages". | ☐ |
| | 12 | "Renkus Heinz Manual; available for sale at least 2004, 6 pages". | ☐ |

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**EXAMINER SIGNATURE**

| Examiner Signature | | Date Considered | |
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*EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through a citation if not in conformance and not considered. Include copy of this form with next communication to applicant.

[1] See Kind Codes of USPTO Patent Documents at www.USPTO.GOV or MPEP 901.04. [2] Enter office that issued the document, by the two-letter code (WIPO Standard ST.3). [3] For Japanese patent documents, the indication of the year of the reign of the Emperor must precede the serial number of the patent document. [4] Kind of document by the appropriate symbols as indicated on the document under WIPO Standard ST.16 if possible. [5] Applicant is to place a check mark here if English language translation is attached.

| INFORMATION DISCLOSURE STATEMENT BY APPLICANT ( Not for submission under 37 CFR 1.99) | | |
|---|---|---|
| | Application Number | 13864248 |
| | Filing Date | 2013-04-17 |
| | First Named Inventor | NICHOLAS; A. J. Millington |
| | Art Unit | 2442 |
| | Examiner Name | SURVILLO, OLEG |
| | Attorney Docket Number | SNS-71301US10(13-0401) |

**CERTIFICATION STATEMENT**

Please see 37 CFR 1.97 and 1.98 to make the appropriate selection(s):

☐ That each item of information contained in the information disclosure statement was first cited in any communication from a foreign patent office in a counterpart foreign application not more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(1).

**OR**

☐ That no item of information contained in the information disclosure statement was cited in a communication from a foreign patent office in a counterpart foreign application, and, to the knowledge of the person signing the certification after making reasonable inquiry, no item of information contained in the information disclosure statement was known to any individual designated in 37 CFR 1.56(c) more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(2).

☐ See attached certification statement.

☐ The fee set forth in 37 CFR 1.17 (p) has been submitted herewith.

☒ A certification statement is not submitted herewith.

**SIGNATURE**

A signature of the applicant or representative is required in accordance with CFR 1.33, 10.18. Please see CFR 1.4(d) for the form of the signature.

| Signature | /Robert J. Irvine III/ | Date (YYYY-MM-DD) | 2015-01-27 |
|---|---|---|---|
| Name/Print | Robert J. Irvine III | Registration Number | 41865 |

This collection of information is required by 37 CFR 1.97 and 1.98. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 1 hour to complete, including gathering, preparing and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

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The Privacy Act of 1974 (P.L. 93-579) requires that you be given certain information in connection with your submission of the attached form related to a patent application or patent. Accordingly, pursuant to the requirements of the Act, please be advised that: (1) the general authority for the collection of this information is 35 U.S.C. 2(b)(2); (2) furnishing of the information solicited is voluntary; and (3) the principal purpose for which the information is used by the U.S. Patent and Trademark Office is to process and/or examine your submission related to a patent application or patent. If you do not furnish the requested information, the U.S. Patent and Trademark Office may not be able to process and/or examine your submission, which may result in termination of proceedings or abandonment of the application or expiration of the patent.

The information provided by you in this form will be subject to the following routine uses:

1. The information on this form will be treated confidentially to the extent allowed under the Freedom of Information Act (5 U.S.C. 552) and the Privacy Act (5 U.S.C. 552a). Records from this system of records may be disclosed to the Department of Justice to determine whether the Freedom of Information Act requires disclosure of these record s.

2. A record from this system of records may be disclosed, as a routine use, in the course of presenting evidence to a court, magistrate, or administrative tribunal, including disclosures to opposing counsel in the course of settlement negotiations.

3. A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.

4. A record in this system of records may be disclosed, as a routine use, to a contractor of the Agency having need for the information in order to perform a contract. Recipients of information shall be required to comply with the requirements of the Privacy Act of 1974, as amended, pursuant to 5 U.S.C. 552a(m).

5. A record related to an International Application filed under the Patent Cooperation Treaty in this system of records may be disclosed, as a routine use, to the International Bureau of the World Intellectual Property Organization, pursuant to the Patent Cooperation Treaty.

6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).

7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (i.e., GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.

8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspections or an issued patent.

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# Electronic Acknowledgement Receipt

| | |
|---|---|
| **EFS ID:** | 21317778 |
| **Application Number:** | 13864248 |
| **International Application Number:** | |
| **Confirmation Number:** | 5095 |
| **Title of Invention:** | SYSTEM AND METHOD FOR SYNCHRONIZING OPERATIONS AMONG A PLURALITY OF INDEPENDENTLY CLOCKED DIGITAL DATA PROCESSING DEVICES |
| **First Named Inventor/Applicant Name:** | Nicholas A. J. Millington |
| **Customer Number:** | 109473 |
| **Filer:** | Robert Johnson Irvine |
| **Filer Authorized By:** | |
| **Attorney Docket Number:** | SNS-71301US10 (13-0401) |
| **Receipt Date:** | 28-JAN-2015 |
| **Filing Date:** | 17-APR-2013 |
| **Time Stamp:** | 19:16:15 |
| **Application Type:** | Utility under 35 USC 111(a) |

## Payment information:

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| Submitted with Payment | no |

## File Listing:

| Document Number | Document Description | File Name | File Size(Bytes)/ Message Digest | Multi Part /.zip | Pages (if appl.) |
|---|---|---|---|---|---|
| 1 | Non Patent Literature | 13907666_Advisory_Action_11-12-14.pdf | 254022<br>aa1d551f2e8767f3e9e1184ed8407caec3fbc7f4 | no | 6 |

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| **Warnings:** | |
| **Information:** | |

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| 2 | Non Patent Literature | 14186850_Advisory_Action_11-26-14.pdf | 506394<br>28ed162aeb999fda046f6ae425395d4aad4a9fee | no | 9 |
| **Warnings:** | | | | | |
| **Information:** | | | | | |
| 3 | Non Patent Literature | 13705176_Advisory_Action_1-8-15.pdf | 147494<br>fae29ffd78e46c8d3b6759f16163b9f25c5e4bee | no | 4 |
| **Warnings:** | | | | | |
| **Information:** | | | | | |
| 4 | Non Patent Literature | Crown_PIP_Manual_2004_68_pages.pdf | 3402875<br>bd58fdeac41e1d1c0dc9fc8d71bfb1c31045ccb4 | no | 68 |
| **Warnings:** | | | | | |
| **Information:** | | | | | |
| 5 | Non Patent Literature | 13533105_Final_OA_12-17-14.pdf | 1315760<br>7e079cc670d11b44802ac99821e5ce2024cf8d4b | no | 36 |
| **Warnings:** | | | | | |
| **Information:** | | | | | |
| 6 | Non Patent Literature | 14184528_Final_OA_12-3-14.pdf | 410080<br>ef6f109bdab572de571a6beb9999ad2543d15c21 | no | 12 |
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| **Information:** | | | | | |
| 7 | Non Patent Literature | 13848932_Final_OA_1-7-15.pdf | 471436<br>487b8268cc5ecf07d340779fb29f58ec0e2b3678 | no | 14 |
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| 8 | Non Patent Literature | 14516867_Non-Final_OA_12-1-14.pdf | 364859<br>7995a26823dedeedac1f2ff1af169f619c4a2a30 | no | 11 |
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| 9 | Non Patent Literature | 13864247_Non-Final_OA_11-17-14.pdf | 344920<br>e8940c60a00e1b96f78ba1dd9800194ca0d14a92 | no | 11 |
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| 10 | Non Patent Literature | 13435739_Non-Final_OA_11-18-14.pdf | 275007<br>3edfdcf99f809a59b2cd9083b4a324ec45e2bf42 | no | 10 |
| **Warnings:** | | | | | |
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| 11 | Non Patent Literature | 13848921_Non-Final_OA_11-19-14.pdf | 271448<br>6aadcec7ebbb239f7aa2cb83beab4fd803caba6f | no | 9 |
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| **Warnings:** | | | | | |
| **Information:** | | | | | |
| 13 | Information Disclosure Statement (IDS) Form (SB08) | SNS-71301US10-SupplDS-JAN2015.pdf | 707762<br>e414a6799808a333dbc32b7a131a200985875bfb | no | 6 |
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**INFORMATION DISCLOSURE STATEMENT BY APPLICANT**
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| | |
|---|---|
| Application Number | 13864248 |
| Filing Date | 2013-04-17 |
| First Named Inventor | Millington, Nicholas A.J. |
| Art Unit | 2442 |
| Examiner Name | SURVILLO, OLEG |
| Attorney Docket Number | SNS-71301US10 (13-0401) |

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| Examiner Initial* | Cite No | Patent Number | Kind Code[1] | Issue Date | Name of Patentee or Applicant of cited Document | Pages,Columns,Lines where Relevant Passages or Relevant Figures Appear |
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| | 1 | 5602992 | | 1997-02-11 | DANNEELS; Gunner | |
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|---|---|---|
| | Application Number | 13864248 |
| | Filing Date | 2013-04-17 |
| | First Named Inventor | Millington, Nicholas A.J. |
| | Art Unit | 2442 |
| | Examiner Name | SURVILLO, OLEG |
| | Attorney Docket Number | SNS-71301US10 (13-0401) |

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| | First Named Inventor | Millington, Nicholas A.J. |
| | Art Unit | 2442 |
| | Examiner Name | SURVILLO, OLEG |
| | Attorney Docket Number | SNS-71301US10 (13-0401) |

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|---|---|---|
| | Application Number | 13864248 |
| | Filing Date | 2013-04-17 |
| | First Named Inventor | Millington, Nicholas A.J. |
| | Art Unit | 2442 |
| | Examiner Name | SURVILLO, OLEG |
| | Attorney Docket Number | SNS-71301US10 (13-0401) |

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| INFORMATION DISCLOSURE STATEMENT BY APPLICANT ( Not for submission under 37 CFR 1.99) | | |
|---|---|---|
| | Application Number | 13864248 |
| | Filing Date | 2013-04-17 |
| | First Named Inventor | Millington, Nicholas A.J. |
| | Art Unit | 2442 |
| | Examiner Name | SURVILLO, OLEG |
| | Attorney Docket Number | SNS-71301US10 (13-0401) |

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|---|---|---|---|
| | 18 | "Welcome. You're watching Apple TV." Apple TV 2nd Generation Setup Guide, 10 March 2011 <http://manuals.info.apple.com/MANUALS/1000/MA1555/en_US/Apple_TV_2nd_gen_Setup_Guide.pdf> Retrieved 10/16/14, 35 pages". | ☐ |
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| INFORMATION DISCLOSURE STATEMENT BY APPLICANT ( Not for submission under 37 CFR 1.99) | | |
|---|---|---|
| | Application Number | 13864248 |
| | Filing Date | 2013-04-17 |
| | First Named Inventor | Millington, Nicholas A.J. |
| | Art Unit | 2442 |
| | Examiner Name | SURVILLO, OLEG |
| | Attorney Docket Number | SNS-71301US10 (13-0401) |

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Please see 37 CFR 1.97 and 1.98 to make the appropriate selection(s):

☐ That each item of information contained in the information disclosure statement was first cited in any communication from a foreign patent office in a counterpart foreign application not more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(1).

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A signature of the applicant or representative is required in accordance with CFR 1.33, 10.18. Please see CFR 1.4(d) for the form of the signature.

| Signature | /Robert J. Irvine III/ | Date (YYYY-MM-DD) | 2014-11-25 |
|---|---|---|---|
| Name/Print | Robert J. Irvine III | Registration Number | 41865 |

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|---|---|
| **EFS ID:** | 20801629 |
| **Application Number:** | 13864248 |
| **International Application Number:** | |
| **Confirmation Number:** | 5095 |
| **Title of Invention:** | SYSTEM AND METHOD FOR SYNCHRONIZING OPERATIONS AMONG A PLURALITY OF INDEPENDENTLY CLOCKED DIGITAL DATA PROCESSING DEVICES |
| **First Named Inventor/Applicant Name:** | Nicholas A. J. Millington |
| **Customer Number:** | 109473 |
| **Filer:** | Robert Johnson Irvine |
| **Filer Authorized By:** | |
| **Attorney Docket Number:** | SNS-71301US10 (13-0401) |
| **Receipt Date:** | 26-NOV-2014 |
| **Filing Date:** | 17-APR-2013 |
| **Time Stamp:** | 13:57:57 |
| **Application Type:** | Utility under 35 USC 111(a) |

## Payment information:

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## File Listing:

| Document Number | Document Description | File Name | File Size(Bytes)/ Message Digest | Multi Part /.zip | Pages (if appl.) |
|---|---|---|---|---|---|
| 1 | Non Patent Literature | 13907666_Advisory_Action_9-5-14.pdf | 152370<br>1707a483855b99e4e8bc2d75050d9bd7bb59be20 | no | 3 |
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| 2 | Non Patent Literature | Bluetooth_Spec_Jul1999-pp1-250.pdf | 8830213<br>457993d17c05be5840592d28de3dd33d01ba8ccd | no | 250 |
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| 3 | Non Patent Literature | Bluetooth_Spec_Jul1999-pp251-500.pdf | 8147096<br>b699b26e7ae50d07d1068934f7ca1ea4f6cf84d1 | no | 250 |
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| 7 | Non Patent Literature | Bluetooth_Spec_Dec1999_Part2-ref.pdf | 23079506<br>a6f9c7298af8fc1645de93b581bf5b1971f92c82 | no | 270 |
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| 10 | Non Patent Literature | Bluetooth_Spec_Dec1999_Part4-ref.pdf | 24728443<br>c63c461b3f3c3f4bc526ebba2f90b46ab0e9105b | no | 266 |
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| 11 | Non Patent Literature | Dell_Reference_Guide_June2000.pdf | 3683918<br>7043da83937ff4a8ce909d3bb6fa0e7d37823556 | no | 70 |
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| 12 | Non Patent Literature | DellStartHereJune2000-ref.pdf | 933107<br>e7c865528f6c143df9033d564b1fa36e8ba533c9 | no | 2 |
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| 13 | Non Patent Literature | 14186850_Final_OA_10-22-14.pdf | 411313<br>aca4329d1740cce08ad80908bd326da9204a924f | no | 12 |
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| 16 | Non Patent Literature | Louderback_2000.pdf | 82331<br>95af6e4eda815588522820e5e10a91c816de6436 | no | 2 |
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| 26 | Non Patent Literature | AppleTV_SetupGuide_3rdGeneration_3-16-12.pdf | 648465<br>17c4524dbb1094901640988121d3fdccb3be13fa | no | 36 |
| **Warnings:** | | | | | |
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| 29 | Foreign Reference | WO0153994.pdf | 5932836<br>09404d5d6d41941a67a7f2c362059700a1f7bc65 | no | 124 |
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| 30 | Information Disclosure Statement (IDS) Form (SB08) | SNS-71301US10-13-0401-SuppIDS-NOV2014.pdf | 708472<br>e8de7065b49c660300521d1ecf5941f3cc423dc4 | no | 7 |
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## (54) System and method for synchronizing operations among a plurality of independently clocked digital data processing devices

(57) A system is described for maintaining synchrony of operations among a plurality of devices that have independent clocking arrangements. The system includes a task distribution device that distributes tasks to a synchrony group comprising a plurality of devices that are to perform the tasks distributed by the task distribution device in synchrony. The task distribution device distributes each task to the members of the synchrony group over a network. Each task is associated with a time stamp that indicates a time, relative to a clock maintained by the task distribution device, at which the members of the synchrony group are to execute o the task. Each member of the synchrony group periodically obtains from the task distribution device an indication of the current time indicated by its clock, determines a time differential between the task distribution device's clock and its respective clock and determines therefrom a time at which, according to its respective clock, the time stamp indicates that it is to execute the task.

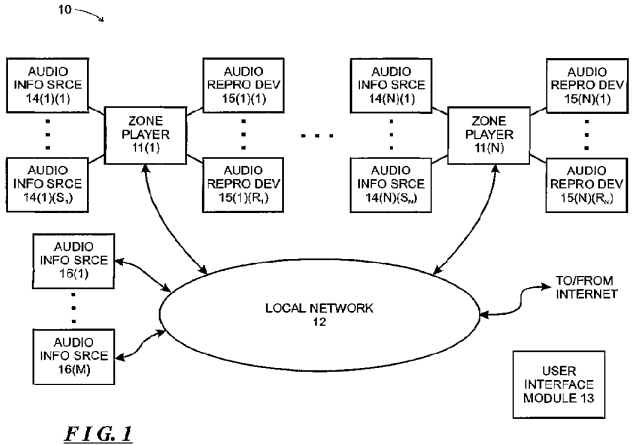



*FIG. 1*

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## Description

### FIELD OF THE INVENTION

**[0001]** The present invention relates generally to the field of digital data processing devices, and more particularly to systems and methods for synchronizing operations among a plurality of independently-clocked digital data processing devices. The invention is embodied in a system for synchronizing operations among a plurality of devices, in relation to information that is provided by a common source. One embodiment of the invention enables synchronizing of audio playback as among two or more audio playback devices that receive audio information from a common information source, or channel.

**[0002]** More generally, the invention relates to the field of arrangements that synchronize output generated by a number of output generators, including audio output, video output, combinations of audio and video, as well as other types of output as will be appreciated by those skilled in the art, provided by a common channel. Generally, the invention will find utility in connection with any type of information for which synchrony among independently-clocked devices is desired.

### BACKGROUND OF THE INVENTION

**[0003]** There are a number of circumstances under which it is desirable to maintain synchrony of operations among a plurality of independently-clocked digital data processing devices in relation to, for example, information that is provided thereto by a common source. For example, systems are being developed in which one audio information source can distribute audio information in digital form to a number of audio playback devices for playback. The audio playback devices receive the digital information and convert it to analog form for playback. The audio playback devices may be located in the same room or they may be distributed in different rooms in a residence such as a house or an apartment, in different offices in an office building, or the like. For example, in a system installed in a residence, one audio playback device may be located in a living room, while another audio playback device is be located in a kitchen, and yet other audio playback devices may be located in various bedrooms of a house. In such an arrangement, the audio information that is distributed to various audio playback devices may relate to the same audio program, or the information may relate to different audio programs. If the audio information source provides audio information relating to the same audio program to two or more audio playback devices at the same time, the audio playback devices will generally contemporaneously play the same program. For example, if the audio information source provides audio information to audio playback devices located in the living room and kitchen in a house at the same time, they will generally contemporaneously play the same program.

**[0004]** One problem that can arise is to ensure that, if two or more audio playback devices are contemporaneously attempting to play back the same audio program, they do so simultaneously. Small differences in the audio playback devices' start times and/or playback speeds can be perceived by a listener as an echo effect, and larger differences can be very annoying. Differences can arise because for a number of reasons, including delays in the transfer of audio information over the network. Such delays can differ as among the various audio playback devices for a variety of reasons, including where they are connected into the network, message traffic and other reasons as will be apparent to those skilled in the art.

**[0005]** Another problem arises from the following. When an audio playback device converts the digital audio information from digital to analog form, it does so using a clock that provides timing information. Generally, the audio playback devices that are being developed have independent clocks, and, if they are not clocking at precisely the same rate, the audio playback provided by the various devices can get out of synchronization.

### SUMMARY OF THE INVENTION

**[0006]** The invention provides a new and improved system and method for synchronizing operations among a number of digital data processing devices that are regulated by independent clocking devices. Generally, the invention will find utility in connection with any type of information for which synchrony among devices connected to a network is desired. The invention is described in connection with a plurality of audio playback devices that receive digital audio information that is to be played back in synchrony, but it will be appreciated that the invention can find usefulness in connection with any kind of information for which coordination among devices that have independent clocking devices would find utility.

**[0007]** In brief summary, the invention provides, in one aspect, a system for maintaining synchrony of operations among plurality of devices that have independent clocking arrangements. The system includes a task distribution device that distributes tasks to a synchrony group comprising a plurality of devices that are to perform the tasks distributed by the task distribution device in synchrony. The task distribution device distributes each task to the members of the synchrony group over a network. Each task is associated with a time stamp that indicates a time, relative to a clock maintained by the task distribution device, at which the members of the synchrony group are to execute the task. Each

member of the synchrony group periodically obtains from the task distribution device an indication of the current time indicated by its clock, determines a time differential between the task distribution device's clock and its respective clock and determines therefrom a time at which, according to its respective clock, the time stamp indicates that it is to execute the task.

**[0008]** In one embodiment, the tasks that are distributed include audio information for an audio track that is to be played by all of the devices comprising the synchrony group synchronously. The audio track is divided into a series of frames, each of which is associated with a time stamp indicating the time, relative to the clock maintained by an audio information channel device, which, in that embodiment, serves as the task distribution device, at which the members of the synchrony group are to play the respective frame. Each member of the synchrony group, using a very accurate protocol, periodically obtains the time indicated by the audio information channel device, and determines a differential between the time as indicated by its local clock and the audio information channel device's clock. The member uses the differential and the time as indicated by the time stamp to determine the time, relative to its local clock, at which it is to play the respective frame. The members of the synchrony group do this for all of the frames, and accordingly are able to play the frames in synchrony.

## BRIEF DESCRIPTION OF THE DRAWINGS

**[0009]** This invention is pointed out with particularity in the appended claims. The above and further advantages of this invention may be better understood by referring to the following description taken in conjunction with the accompanying drawings, in which:

FIG. 1 schematically depicts an illustrative networked audio system, constructed in accordance with the invention;
FIG. 2 schematically depicts a functional block diagram of a synchrony group utilizing a plurality of zone players formed within the networked audio system depicted in FIG. 1 ;
FIG. 2A schematically depicts two synchrony groups, illustrating how a member of one synchrony group can provide audio information to the members of another synchrony group;
FIG. 3 depicts an functional block diagram of a zone player for use in the networked audio system depicted in FIG. 1 ; and
FIG. 4 is useful in understanding an digital audio information framing methodology useful in the network audio system depicted in FIG. 1.

## DETAILED DESCRIPTION OF AN ILLUSTRATIVE EMBODIMENT

**[0010]** FIG. 1 depicts an illustrative network audio system 10 constructed in accordance with the invention. With reference to FIG. 1, the network audio system 10 includes a plurality of zone players 11(1) through 11(N) (generally identified by reference numeral 11(n)) interconnected by a local network 12, all of which operate under control of one or more user interface modules generally identified by reference numeral 13. One or more of the zone players 11(n) may also be connected to one or more audio information sources, which will generally be identified herein by reference numeral 14(n)(s), and/or one or more audio reproduction devices, which will generally be identified by reference numeral 15(n)(r). In the reference numeral 14(n)(s), index "n" refers to the index "n" of the zone player 11(n) to which the audio information source is connected, and the index "s" (s=1,...,$S_n$) refers to the "s-th" audio information source connected to that "n-th" zone player 11(n). Thus, if, for example, a zone player 11(n) is connected to four audio information sources 14(n)(1) through 14(n)(4), the audio information sources may be generally identified by reference numeral 14(n)(s), with $S_n$=4. It will be appreciated that the number of audio information sources $S_n$ may vary as among the various zone players 11(n), and some zone players may not have any audio information sources connected thereto. Similarly, in the reference numeral 15(n)(r), index "n" refers to the index "n" of the zone player 11(n) to which the audio reproduction device is connected, and the index "r" (r=1,...,$R_n$) refers to the "r-th" audio information source connected to that "n-th" zone player 11(n). In addition to the audio information sources 14(n)(s), the network audio system 10 may include one or more audio information sources 16(1) through 16(M) connected through appropriate network interface devices (not separately shown) to the local network 12. Furthermore, the local network may include one or more network interface devices (also not separately shown) that are configured to connect the local network 12 to other networks, including a wide area network such as the Internet, the public switched telephony network (PSTN) or other networks as will be apparent to those skilled in the art, over which connections to audio information sources may be established.

**[0011]** The zone players 11(n) associated with system 10 may be distributed throughout an establishment such as residence, an office complex, a hotel, a conference hall, an amphitheater or auditorium, or other types of establishments as will be apparent to those skilled in the art or the like. For example, if the zone players 11(n) and their associated audio information source(s) and/or audio reproduction device(s) are distributed throughout a residence, one, such as zone player 11(1) and its associated audio information source(s) and audio reproduction device(s) may be located in a living

room, another may be located in a kitchen, another may be located in a dining room, and yet others may be located in respective bedrooms, to selectively provide entertainment in those rooms. On the other hand, if the zone players 11(n) and their associated audio information source(s) and/or audio reproduction device(s) are distributed throughout an office complex, one may, for example, be provided in each office to selectively provide entertainment to the employees in the respective offices. Similarly, if the zone players 11(n) and associated audio information source(s) and/or audio reproduction device(s) are used in a hotel, they may be distributed throughout the rooms to provide entertainment to the guests. Similar arrangements may be used with zone players 11(n) and associated audio information source(s) and/or audio reproduction device(s) used in an amphitheater or auditorium. Other arrangements in other types of environments will be apparent to those skilled in the art. In each case, the zone players 11(n) can be used to selectively provide entertainment in the respective locations, as will be described below.

**[0012]** The audio information sources 14(n)(s) and 16(m) may be any of a number of types of conventional sources of audio information, including, for example, compact disc ("CD") players, AM and/or FM radio receivers, analog or digital tape cassette players, analog record turntables and the like. In addition, the audio information sources 14(n)(s) and 16(m) may comprise digital audio files stored locally on, for example, personal computers (PCs), personal digital assistants (PDAs), or similar devices capable of storing digital information in volatile or non-volatile form. As noted above, the local network 12 may also have an interface (not shown) to a wide area network, over which the network audio system 10 can obtain audio information. Moreover, one or more of the audio information sources 14(n)(s) may also comprise an interface to a wide area network such as the Internet, the public switched telephony network (PSTN) or any other source of audio information. In addition, one or more of the audio information sources 14(n)(s) and 16(m) may comprise interfaces to radio services delivered over, for example, satellite. Audio information obtained over the wide area network may comprise, for example, streaming digital audio information such as Internet radio, digital audio files stored on servers, and other types of audio information and sources as will be appreciated by those skilled in the art. Other arrangements and other types of audio information sources will be apparent to those skilled in the art.

**[0013]** Generally, the audio information sources 14(n)(s) and 16(m) provide audio information associated with audio programs to the zone players for playback. A zone player that receives audio information from an audio information source 14(n)(s) that is connected thereto can provide playback and/or forward the audio information, along with playback timing information, over the local network 12 to other zone players for playback. Similarly, each audio information source 16(m) that is not directly connected to a zone player can transmit audio information over the network 12 to any zone player 11(n) for playback. In addition, as will be explained in detail below, the respective zone player 11(n) can transmit the audio information that it receives either from an audio information source 14(n)(s) connected thereto, or from an audio information source 16(m), to selected ones of the other zone players 11(n'), 11(n''),... (n not equal to n', n'',...) for playback by those other zone players. The other zone players 11(n'), 11(n''),... to which the zone player 11(n) transmits the audio information for playback may be selected by a user using the user interface module 13. In that operation, the zone player 11(n) will transmit the audio information to the selected zone players 11(n'), 11(n''),... over the network 12. As will be described below in greater detail, the zone players 11(n), 11(n'), 11(n''),... operate such that the zone players 11(n'), 11(n''),... synchronize their playback of the audio program with the playback by the zone player 11(n), so that the zone players 11(n), 11(n'), 11(n'') provide the same audio program at the same time.

**[0014]** Users, using user interface module 13, may also enable different groupings or sets of zone players to provide audio playback of different audio programs synchronously. For example, a user, using a user interface module 13, may enable zone players 11(1) and 11(2) to play one audio program, audio information for which may be provided by, for example, one audio information source 14(1)(1). The same or a different user may, using the same or a different user interface module 13, enable zone players 11 (4) and 11(5) to contemporaneously play another audio program, audio information for which may be provided by a second audio information source, such as audio information source 14(5)(2). Further, a user may enable zone player 11(3) to contemporaneously play yet another audio program, audio information for which may be provided by yet another audio information source, such as audio information source 16(1). As yet another possibility, a user may contemporaneously enable zone player 11(1) to provide audio information from an audio information source connected thereto, such as audio information source 14 (1) (2), to another zone player, such as zone player 11(6) for playback.

**[0015]** In the following, the term "synchrony group" will be used to refer to a set of one or more zone players that are to play the same audio program synchronously. Thus, in the above example, zone players 11(1) and 11(2) comprise one synchrony group, zone player 11(3) comprises a second synchrony group, zone players 11 (4) and 11(5) comprise a third synchrony group, and zone player 11(6) comprises yet a fourth synchrony group. Thus, while zone players 11(1) and 11(2) are playing the same audio program, they will play the audio program synchronously. Similarly, while zone players 11(4) and 11(5) are playing the same audio program, they will play the audio program synchronously. On the other hand, zone players that are playing different audio programs may do so with unrelated timings. That is, for example, the timing with which zone players 11(1) and 11(2) play their audio program may have no relationship to the timing with which zone player 11 (3), zone players 11(4) and 11(5), and zone player 11(6) play their audio programs. It will be appreciated that, since "synchrony group" is used to refer to sets of zone players that are playing the same audio program

synchronously, zone player 11(1) will not be part of zone player 11(6)'s synchrony group, even though zone player 11(1) is providing the audio information for the audio program to zone player 11(6).

**[0016]** In the network audio system 10, the synchrony groups are not fixed. Users can enable them to be established and modified dynamically. Continuing with the above example, a user may enable the zone player 11(1) to begin providing playback of the audio program provided thereto by audio information source 14(1)(1), and subsequently enable zone player 11(2) to join the synchrony group. Similarly, a user may enable the zone player 11 (5) to begin providing playback of the audio program provided thereto by audio information source 14(5)(2), and subsequently enable zone player 11(4) to join that synchrony group. In addition, a user may enable a zone player to leave a synchrony group and possibly join another synchrony group. For example, a user may enable the zone player 11 (2) to leave the synchrony group with zone player 11(1), and join the synchrony group with zone player 11(6). As another possibility, the user may enable the zone player 11(1) to leave the synchrony group with zone player 11(2) and join the synchrony group with zone player 11(6).In connection with the last possibility, the zone player 11(1) can continue providing audio information from the audio information source 14(1)(1) to the zone player 11(2) for playback thereby.

**[0017]** A user, using the user interface module 13, can enable a zone player 11(n) that is currently not a member of a synchrony group to join a synchrony group, after which it will be enabled to play the audio program that is currently being played by that synchrony group. Similarly, a user, also using the user interface module 13, can enable a zone player 11(n) that is currently a member of one synchrony group, to disengage from that synchrony group and join another synchrony group, after which that zone player will be playing the audio program associated with the other synchrony group. For example, if a zone player 11(6) is currently not a member of any synchrony group, it, under control of the user interface module 13, can become a member of a synchrony group, after which it will play the audio program being played by the other members of the synchrony group, in synchrony with the other members of the synchrony group. In becoming a member of the synchrony group, zone player 11(6) can notify the zone player that is the master device for the synchrony group that it wishes to become a member of its synchrony group, after which that zone player will also transmit audio information associated with the audio program, as well as timing information, to the zone player 11(6).As the zone player 11(6) receives the audio information and the timing information from the master device, it will play the audio information with the timing indicated by the timing information, which will enable the zone player 11(6) to play the audio program in synchrony with the other zone player(s) in the synchrony group.

**[0018]** Similarly, if a user, using the user interface module 13, enables a zone player 11(n) associated with a synchrony group to disengage from that synchrony group, and if the zone player 11(n) is not the master device of the synchrony group, the zone player 11(n) can notify the master device, after which the master device can terminate transmission of the audio information and timing information to the zone player 11(n). If the user also enables the zone player 11(n) to begin playing another audio program using audio information from an audio information source 14(n)(s) connected thereto, it will acquire the audio information from the audio information source 14(n)(s) and initiate playback thereof. If the user enables another zone player 11(n') to join the synchrony group associated with zone player I 11(n), operations in connection therewith can proceed as described immediately above.

**[0019]** As yet another possibility, if a user, using the user interface module 13, enables a zone player 11(n) associated with a synchrony group to disengage from that synchrony group and join another synchrony group, and if the zone player is not the master device of the synchrony group from which it is disengaging, the zone player 11(n) can notify the master device of the synchrony group from which it is disengaging, after which that zone player will terminate transmission of audio information and timing information to the zone player 11(n) that is disengaging. Contemporaneously, the zone player 11(n) can notify the master device of the synchrony group that it (that is, zone player 11(n)) is joining, after which the master device can begin transmission of audio information and timing information to that zone player 11(n). The zone player 11(n) can thereafter begin playback of the audio program defined by the audio information, in accordance with the timing information so that the zone player 11(n) will play the audio program in synchrony with the master device.

**[0020]** As yet another possibility, a user, using the user interface module 13, may enable a zone player 11(n) that is not associated with a synchrony group, to begin playing an audio program using audio information provided to it by an audio information source 14(n)(s) connected thereto. In that case, the user, also using the user interface module 13 or a user interface device that is specific to the audio information source 14(n)(s), can enable the audio information source 14(n)(s) to provide audio information to the zone player 11(n). After the zone player 11(n) has begun playback, or contemporaneously therewith, the user, using the user interface module 13, can enable other zone players 11(n'), 11(n"),... to join zone player 11(n) 's synchrony group and enable that zone player 11(n) to transmit audio information and timing information thereto as described above, to facilitate synchronous playback of the audio program by the other zone players 11(n'), 11(n")....

**[0021]** A user can use the user interface module 13 to control other aspects of the network audio system 10, including but not limited to the selection of the audio information source 14(n)(s) that a particular zone player 11(n) is to utilize, the volume of the audio playback, and so forth. In addition, a user may use the user interface module 13 to turn audio information source(s) 14(n)(s) on and off and to enable them to provide audio information to the respective zone players 11(n).

**[0022]** Operations performed by the various devices associated with a synchrony group will be described in connection with FIG. 2, which schematically depicts a functional block diagram of a synchrony group in the network audio system 10 described above in connection with FIG. 1. With reference to FIG. 2, a synchrony group 20 includes a master device 21 and zero or more slave devices 22(1) through 22 (G) (generally identified by reference numeral 22(g)), all of which synchronously play an audio program provided by an audio information channel device 23. Each of the master device 21, slave devices 22(g) and audio information channel device 23 utilizes a zone player 11(n) depicted in FIG. 1, although it will be clear from the description below that a zone player may be utilized both for the audio information channel device for the synchrony group 20, and the master device 21 or a slave device 22(g) of the synchrony group 20. As will be described below in more detail, the audio information channel device 23 obtains the audio information for the audio program from an audio information source, adds playback timing information, and transmits the combined audio and playback timing information to the master device 21 and slave devices 22(g) over the network 12 for playback. The playback timing information that is provided with the audio information, together with clock timing information provided by the audio information channel device 23 to the various devices 21 and 22(g) as will be described below, enables the master device 21 and slave devices 22(g) of the synchrony group 20 to play the audio information simultaneously.

**[0023]** The master device 21 and the slave devices 22(g) receive the audio and playback timing information, as well as the clock timing information, that are provided by the audio information channel device 23, and play back the audio program defined by the audio information. The master device 21 is also the member of the synchrony group 20 that communicates with the user interface module 13 and that controls the operations of the slave devices 22(g) in the synchrony group 20. In addition, the master device 21 controls the operations of the audio information channel device 23 that provides the audio and playback timing information for the synchrony group 20. Generally, the initial master device 21 for the synchrony group will be the first zone player 11(n) that a user wishes to play an audio program. However, as will be described below, the zone player 11(n) that operates as the master device 21 can be migrated from one zone player 11(n) to another zone player 11(n'), which preferably will be a zone player that is currently operating as a slave device 22(g) in the synchrony group.

**[0024]** In addition, under certain circumstances, as will be described below, the zone player 11(n) that operates as the audio information channel device 23 can be migrated from one zone player to another zone player, which also will preferably will be a zone player that is currently operating as a member of the synchrony group 20. It will be appreciated that the zone player that operates as the master device 21 can be migrated to another zone player independently of the migration of the audio information channel device 23. For example, if one zone player 11(n) is operating as both the master device 21 and the audio information channel device 23 for a synchrony group 20, the master device 21 can be migrated to another zone player 11(n') while the zone player 11(n) is still operating as the audio information channel device 23. Similarly, if one zone player 11(n) is operating as both the master device 21 and the audio information channel device 23 for a synchrony group 20, the audio information channel device 23 can be migrated to another zone player 11(n') while the zone player 11(n) is still operating as the master device 21. In addition, if one zone player 11(n) is operating as both the master device 21 and the audio information channel device 23 for a synchrony group 20, the master device 21 can be migrated to another zone player 11(n') and the audio information channel device can be migrated to a third zone player 11(n").

**[0025]** The master device 21 receives control information from the user interface module 13 for controlling the synchrony group 20 and provides status information indicating the operational status of the synchrony group to the user interface module 13. Generally, the control information from the user interface module 13 enables the master device 21 to, in turn, enable the audio information channel device 23 to provide audio and playback timing information to the synchrony group to enable the devices 21 and 22(g) that are members of the synchrony group 20 to play the audio program synchronously. In addition, the control information from the user interface module 13 enables the master device 21 to, in turn, enable other zone players to join the synchrony group as slave devices 22(g) and to enable slave devices 22(g) to disengage from the synchrony group. Control information from the user interface module 13 can also enable the zone player 11(n) that is currently operating as the master device 21 to disengage from the synchrony group, but prior to doing so that zone player will enable the master device 21 to transfer from that zone player 11(n) to another zone player 11(n'), preferably to a zone player 11(n') that is currently a slave device 22(g) in the synchrony group 20. The control information from the user interface module 13 can also enable the master device 21 to adjust its playback volume and to enable individual ones of the various slave devices 22(g) to adjust their playback volumes. In addition, the control information from the user interface module 13 can enable the synchrony group 20 to terminate playing of a current track of the audio program and skip to the next track, and to re-order tracks in a play list of tracks defining the audio program that is to be played by the synchrony group 20.

**[0026]** The status information that the master device 21 may provide to the user interface module 13 can include such information as a name or other identifier for the track of the audio work that is currently being played, the names or other identifiers for upcoming tracks, the identifier of the zone player 11(n) that is currently operating as the master device 21, and identifiers of the zone players that are currently operating as slave devices 22(g). In one embodiment, the user interface module 13 includes a display (not separately shown) that can display the status information to the user.

**[0027]** It will be appreciated that the zone player 11(n) that is operating as the audio information channel device 23 for one synchrony group may also comprise the master device 21 or any of the slave devices 22(g) in another synchrony group. This may occur if, for example, the audio information source that is to provide the audio information that is to be played by the one synchrony group is connected to a zone player also being utilized as the master device or a slave device for the other synchrony group. This will be schematically illustrated below in connection with FIG. 2A. Since, as noted above, the zone player 11(n) that is operating as the audio information channel device 23 for the synchrony group 20 may also be operating as a master device 21 or slave device 22(g) for another synchrony group, it can also be connected to one or more audio reproduction devices 15(n)(r), although that is not depicted in FIG. 2. Since the master device 21 and slave devices 22(g) are all to provide playback of the audio program, they will be connected to respective audio reproduction devices 15(n)(r). Furthermore, it will be appreciated that one or more of the zone players 11(n) that operate as the master device 21 and slave devices 22(g) in synchrony group 20 may also operate as an audio information channel device for that synchrony group or for another synchrony group and so they may be connected to one or more audio information sources 14(n)(s), although that is also not depicted in FIG. 2. In addition, it will be appreciated that a zone player 11(n) can also operate as a audio information channel device 23 for multiple synchrony groups.

**[0028]** If the audio information channel device 23 does not utilize the same zone player as the master device 21, the master device 21 controls the audio information channel device by exchanging control information over the network 12 with the audio information channel device 23. The control information is represented in FIG. 2 by the arrow labeled CHAN_DEV_CTRL_INFO. The control information that the master device 21 provides to the audio information channel device 23 will generally depend on the nature of the audio information source that is to provide the audio information for the audio program that is to be played and the operation to be enabled by the control information. If, for example, the audio information source is a conventional compact disc, tape, or record player, broadcast radio receiver, or the like, which is connected to a zone player 11(n), the master device 21 may merely enable the zone player serving as the audio information channel device 23 to receive the audio information for the program from the audio information source. It will be appreciated that, if the audio information is not in digital form, the audio information channel device 23 will convert it to digital form and provide the digitized audio information, along with the playback timing information, to the master device 21 and slave devices 22(g).

**[0029]** On the other hand, if the audio information source is, for example, a digital data storage device, such as may be on a personal computer or similar device, the master device 21 can provide a play list to the audio information channel device 23 that identifies one or more files containing the audio information for the audio program. In that case, the audio information channel device 23 can retrieve the files from the digital data storage device and provide them, along with the playback timing information, to the master device 21 and the slave devices 22(g). It will be appreciated that, in this case, the audio information source may be directly connected to the audio information channel device 23, as, for example, an audio information source 14(n)(s), or it may comprise an audio information source 16(m) connected to the network 12. As a further alternative, if the audio information source is a source available over the wide area network, the master device 21 can provide a play list comprising a list of web addresses identifying the files containing the audio information for the audio program that is to be played, and in that connection the audio information channel device 23 can initiate a retrieval of the files over the wide area network. As yet another alternative, if the audio information source is a source of streaming audio received over the wide area network, the master device 21 can provide a network address from which the streaming audio can be received. Other arrangements by which the master device 21 can control the audio information channel device 23 will be apparent to those skilled in the art.

The master device 21 can also provide control information to the synchrony group's audio information channel device 23 to enable a migration from one zone player 11(n) to another zone player 11(n'). This may occur if, for example, the audio information source is one of audio information sources 16 or a source accessible over the wide area network via the network 12. The master device 21 can enable migration of the audio information channel device 23 for several reasons, including, for example, to reduce the loading of the zone player 11(n), to improve latency of message transmission in the network 12, and other reasons as will be appreciated by those skilled in the art.

**[0030]** As noted above, the audio information channel device 23 provides audio and playback timing information for the synchrony group to enable the master device 21 and slave devices 22(g) to play the audio program synchronously. Details of the audio and playback timing information will be described in detail below in connection with FIGS. 3 and 4, but, in brief, the audio information channel device 23 transmits the audio and playback timing information in messages over the network 12 using a multi-cast message transmission methodology. In that methodology, the audio information channel device 23 will transmit the audio and playback timing information in a series of messages, with each message being received by all of the zone players 11(n) comprising the synchrony group 20, that is, by the master device 21 and the slave devices 22(g). Each of the messages includes a multi-cast address, which the master device 21 and slave devices 22(g) will monitor and, when they detect a message with that address, they will receive and use the contents of the message. The audio and playback timing information is represented in FIG. 2 by the arrow labeled "AUD+PBTIME INFO," which has a single tail, representing a source for the information at the audio information channel device 23, and multiple arrowheads representing the destinations of the information, with one arrowhead extending to the master device

21 and other arrowheads extending to each of the slave devices 22(g) in the synchrony group 20. The audio information channel device 23 may make use of any convenient multi-cast message transmission methodology in transmitting the audio and playback timing information to the synchrony group 20. As will be described in detail in connection with FIG. 4, the audio and playback timing information is in the form of a series of frames, with each frame having a time stamp. The time stamp indicates a time, relative to the time indicated by a clock maintained by the audio information channel device 23, at which the frame is to be played. Depending on the size or sizes of the messages used in the selected multi-cast message transmission methodology and the size or sizes of the frames, a message may contain one frame, or multiple frames, or, alternatively, a frame may extend across several messages.

**[0031]** The audio information channel device 23 also provides clock time information to the master device 21 and each of the slave devices 22(g) individually over network 12 using a highly accurate clock time information transmission methodology. The distribution of the clock time information is represented in FIG. 2 by the arrows labeled "AICD_CLK_INF (M)" (in the case of the clock time information provided to the master device 21) and "AICD_CLK_INF ($S_1$)" through "AICD_CLK_INF ($S_G$)" (in the case of audio information channel device clock information provided to the slave devices 22(g)). In one embodiment, the master device 21 and slave devices 22(g) make use of the well-known SNTP (Simple Network Time Protocol) to obtain current clock time information from the audio information channel device 23. The SNTP makes use of a unicast message transfer methodology, in which one device, such as the audio information channel device 23, provides clock time information to a specific other device, such as the master device 21 or a slave device 22(g), using the other device's network, or unicast, address. Each of the master device 21 and slave devices 22(g) will periodically initiate SNTP transactions with the audio information channel device 23 to obtain the clock time information from the audio information channel device 23. As will be described below in more detail, the master device 21 and each slave device 22(g) make use of the clock time information to determine the time differential between the time indicated by the audio information channel device's clock and the time indicated by its respective clock, and use that time differential value, along with the playback time information associated with the audio information and the respective device's local time as indicated by its clock to determine when the various frames are to be played. This enables the master device 21 and the slave devices 22(g) in the synchrony group 20 to play the respective frames simultaneously.

**[0032]** As noted above, the control information provided by the user to the master device 21 through the user interface module 13 can also enable the master device 21 to, in turn, enable another zone player 11(n') to join the synchrony group as a new slave device 22(g). In that operation, the user interface module 13 will provide control information, including the identification of the zone player 11(n') that is to join the synchrony group to the master device 21. After it receives the identification of the zone player 11(n') that is to join the synchrony group, the master device 21 will exchange control information, which is represented in FIG. 2 by the arrows labeled SLV_DEV_CTRL_INF ($S_1$) through SLV_DEV_CTRL_INF ($S_G$) group slave control information, over the network 12 with the zone player I 11(n') that is identified in the control information from the user interface module 13. The control information that the master device 21 provides to the new zone player 11(n') includes the network address of the zone player 11(n) that is operating as the audio information channel device 23 for the synchrony group, as well as the multi-cast address that the audio information channel device 23 is using to broadcast the audio and playback timing information over the network. The zone player that is to operate as the new slave device 22(g') uses the multi-cast address to begin receiving the multi-cast messages that contain the audio information for the audio program being played by the synchrony group.

**[0033]** It will be appreciated that, if the zone player 11(n) that is operating as the master device 21 for the synchrony group 20 is also operating the audio information channel device 23, and if there are no slave devices 22(g) in the synchrony group 20, the audio information channel device 23 may not be transmitting audio and playback timing information over the network. In that case, if the new slave device 22(g') is the first slave device in the synchrony group, the zone player 11(n) that is operating as both the master device 21 and audio information channel device 23, can begin transmitting the audio and playback timing information over the network 12 when the slave device 22(g') is added to the synchrony group 20. The zone player 11(n) can maintain a count of the number of slave devices 22(g) in the synchrony group 20 as they join and disengage, and, if the number drops to zero, it can stop transmitting the audio and playback timing information over the network 12 to reduce the message traffic over the network 12.

**[0034]** The new slave device 22(g') added to the synchrony group 20 uses the network address of the audio information channel device 23 for several purposes. In particular, the new slave device 22(g') will, like the master device 21 (assuming the zone player 11(n) operating as the master device 21 is not also the audio information channel device 23), engage in SNTP transactions with the audio information channel device 23 to obtain the clock timing information from the audio information channel device 23. In addition, the new slave device 22(g') can notify the audio information channel device 23 that it is a new slave device 22(g') for the synchrony group 20 and provide the audio information channel device 23 with its network address. As will be described below, in one embodiment, particularly in connection with audio information obtained from a source, such as a digital data storage device, which can provide audio information at a rate that is faster than the rate at which it will be played, the audio information channel device 23 will buffer audio and timing information and broadcast it over the network 12 to the synchrony group 20 generally at a rate at which it is provided by the source. Accordingly, when a new slave device 22(g') joins the synchrony group 20, the playback timing information may indicate

that the audio information that is currently being broadcast by the audio information channel device 23 using the multicast methodology is to be played back some time in the future. To reduce the delay with which the new slave device 22(g') will begin playback, the audio information channel device 23 can also retransmit previously transmitted audio and timing information that it had buffered to the new slave device 22(g') using the unicast network address of the slave device 22(g').

**[0035]** The master device 21 can also use the slave device control information exchanged with the slave devices 22(g) for other purposes. For example, the master device 21 can use the slave device control information to initiate a migration of the master from its zone player 11(n) to another zone player 11(n'). This may occur for any of a number of reasons, including, for example, that the master device 21 is terminating playback by it of the audio program and is leaving the synchrony group 20, but one or more of the other devices in the synchrony group is to continue playing the audio program. The master device 21 may also want to initiate a migration if it is overloaded, which can occur if, for example, the zone player 11(n) that is the master device 21 for its synchrony group is also operating as an audio information channel device 23 for another synchrony group.

**[0036]** The user can also use the user interface module 13 to adjust playback volume by the individual zone players 11(n) comprising the synchrony group. In that operation, the user interface module 13 provides information identifying the particular device whose volume is to be adjusted, and the level at which the volume is to be set to the master device 21. If the device whose volume is to be adjusted is the master device 21, the master device 21 can adjust its volume according to the information that it receives from the user interface module 13. On the other hand, if the device whose volume is to be adjusted is a slave device 22(g), the master device 21 can provide group slave control information to the respective slave device 22(g), to enable it to adjust its volume.

**[0037]** The user can also use the user interface module 13 to enable a synchrony group 20 to cancel playing of the track in an audio program that is currently being played, and to proceed immediately to the next track. This may occur, for example, if the tracks for the program is in the form of a series of digital audio information files, and the user wishes to cancel playback of the track that is defined by one of the files. In that case, when the master device 21 receives the command to cancel playback of the current track, it will provide channel device control information to the audio information channel device 23 so indicating. In response, the audio information channel device 23 inserts control information into the audio and playback timing information, which will be referred to as a "resynchronize" command. In addition, the audio information channel device 23 will begin transmitting audio information for the next track, with timing information to enable it to be played immediately. The resynchronize command can also enable playback of a track to be cancelled before it has been played. Details of these operations will be described below.

**[0038]** As noted above, there may be multiple synchrony groups in the network audio system 10, and further that, for example, a zone player 11(n) may operate both as a master device 21 or a slave device 22(g) in one synchrony group, and as the audio information channel device 23 providing audio and playback timing information and clock timing information for another synchrony group. An illustrative arrangement of this will be described in connection with FIG. 2A. With reference to FIG. 2A, that FIG. depicts elements of two synchrony groups, identified by reference numerals 20(1) and 20(2), respectively. For clarity, FIG. 2A does not show a number of elements, the presence of which would be evident from FIGS. 1 and 2 as described above. For example, FIG. 2A does not depict the audio information sources from which audio information is obtained for the synchrony groups or the audio reproduction devices that are used to produce sound for the master and slave devices, which are depicted in both FIGS. 1 and 2. In addition, FIG. 2A does not depict arrows that represent control information provided by the respective master devices to the slave devices in the respective synchrony groups, or to the audio information channel devices that provide audio and timing information for the respective synchrony groups, which are depicted in FIG. 2. In addition, FIG.2A does not depict the arrows that represent the clock timing information provided by the audio information channel devices to the respective members of the respective synchrony groups, which are also depicted in FIG. 2. As will be noted below, however, FIG. 2A does depict arrows representing the audio and playback timing information provided by the respective audio information channel devices for the respective synchrony groups 20(1), 20(2), to the master and slave devices comprising the respective synchrony groups 20(1), 20(2).

**[0039]** Each synchrony group 20(1), 20(2) comprises elements of a number of zone players. A functional block diagram of a zone player will be described below in connection with FIG. 3. Synchrony group 20(1) includes a master device 21(1) and "K" slave devices 22(1)(1) through 22(K)(1) (the index "1" in reference numeral 21(1) and the last index in reference numeral 22(1)(1) through 21(K)(1) corresponds to the index of the synchrony group 20(1) to which they belong) utilize zone players 11(1) and 11(K+1) respectively. Similarly, synchrony group 20(2) includes a master device 21(2) and "L" slave devices 22(1)(2) through 22(L)(2) that utilize zone players 11(K+2) through 11(K+L+2). In the illustrative arrangement depicted in FIG. 2A, both synchrony groups 20(1) and 20(2) are controlled by the user interface module 13, which can provide control information to, and receive status information from, the master devices 21(1) and 21(2) independently. It will be appreciated that separate user interface modules may be provided to provide control information to, and receive status information from, the respective master devices 21(1),21(2).

**[0040]** As noted above, the slave device 22(1)(2) in synchrony group 20(2) utilizes zone player 11(K+3). In the illustrative

arrangement depicted in FIG. 2A, the audio information channel device 23(1) that provides audio and playback timing information to the master and slave devices 21(1), 22(1)(1),..., 22(K)(1) of synchrony group 20(1) also utilizes zone player 11(K+3). As noted above, this may occur if, for example, the audio information source that is to provide audio information to be played by the synchrony group 20(1) is connected to the zone player 11(K+3). Thus, when the master device 21(1) of synchrony group 20(1) exchanges channel device control information with the audio information channel device 23(1), it is effectively exchanging channel device control information with the zone player 11(K+3). Similarly, when the master and slave devices 21(1), 22(1)(1),..., 22(K)(1) of synchrony group 20(1) receive audio and playback timing information, as well as clock timing information, from the audio information channel device 23(1), they are effectively receiving the information from the zone player 11(K+3). FIG.2A depicts a multi-headed arrow representing audio and playback timing information transmitted by the zone player 11(K+3), as audio information channel device 23(1), to the master and slave devices 21(1), 22(1)(1),...,11(K)(1) comprising synchrony group 20(1).

**[0041]** On the other hand, in the illustrative arrangement depicted in FIG. 2A, the synchrony group 20(2) utilizes a zone player 11(K+L+3) as its audio information channel device 23(2). As with synchrony group 20(1), when the master device 21(2) of synchrony group 20(2) exchanges channel device control information with the audio information channel device 23(2), it is effectively exchanging channel device control information with the zone player 11(K+L+3). Similarly, when the master and slave devices 21(2), 22(1)(2),..., 22(L)(2) of synchrony group 20(2) receive audio and playback timing information, as well as clock timing information, from the audio information channel device 23(2), they are effectively receiving the information from the zone player 11(K+L+3). FIG. 2A depicts a multi-headed arrow representing audio and playback timing information transmitted by the zone player 11(K+3) as audio information channel device 23(2) to the master and slave devices 21(2), 22(1) (2),..., 22(L) (2) comprising synchrony group 20(2).

**[0042]** In the illustrative arrangement depicted in FIG. 2A, zone player 11(K+L+3), which is the audio information channel device 23(2) for synchrony group 20(2), is not shown as being either a master or a slave device in another synchrony group. However, it will be appreciated that zone player 11(K+L+3) could also be utilized as the master device or a slave device for another synchrony group. Indeed, it will be appreciated that the zone player that is utilized as the audio information channel device for synchrony group 20(2) may also be a zone player that is utilized as the master device 21(1) or a slave device 22(1) (1),..., 22(K)(1) in the synchrony group 20(1).

**[0043]** A zone player 11(n) that is utilized as a member of one synchrony group may also be utilized as the audio information channel device for another synchrony group if the audio information source that is to supply the audio information that is to be played by the other synchrony group is connected to that zone player 11(n). A zone player 11(n) may also be utilized as the audio information channel device for the other synchrony group if, for example, the audio information source is an audio information source 16(m) (FIG.1) that is connected to the network 12 or an audio information source that is available over a wide area network such as the Internet. The latter may occur if, for example, the zone player 11(n) has sufficient processing power to operate as the audio information channel device and it is in an optimal location in the network 12, relative to the zone players comprising the other synchrony group (that is the synchrony group for which it is operating as audio information channel device) for providing the audio and playback timing information to the members of the other synchrony group. Other circumstances under which the zone player 11(n) that is utilized as a member of one synchrony group may also be utilized as the audio information channel device for another synchrony group will be apparent to those skilled in the art.

**[0044]** As was noted above, the master device 21 for a synchrony group 20 may be migrated from one zone player 11(n) to another zone player 11 (n'). As was further noted above, the audio information channel device 23 for a synchrony group 20 may be migrated from one zone player 11(n) to another zone player 11(n'). It will be appreciated that the latter may occur if, for example, the audio information source that provides the audio program for the synchrony group is not connected to the zone player 11(n) that is operating as the audio information channel device 23, but instead is one of the audio information sources 16(m) connected to the network 12 or a source available over a wide area network such as the Internet. Operations performed during a migration of an audio information channel device 23 from one zone player 11(n) to another zone player 11(n') will generally depend on the nature of the audio information that is being channeled by the audio information channel device 23. For example, if the audio information source provides streaming audio, the zone player 11(n) that is currently operating as the audio information channel device 23 for the synchrony group 20, can provide the following information to the other zone player 11(n') that is to become the audio information channel device 23 for the synchrony group 20:

(a) the identification of the source of the streaming audio information,
(b) the time stamp associated with the frame that the zone player 11(n) is currently forming, and
(c) the identifications of the zone players that are operating as the master device 21 and slave devices 22(g) comprising the synchrony group 20.

After the zone player 11(n') receives the information from the zone player 11(n), it will begin receiving the streaming

audio from the streaming audio information source identified by the zone player I 11(n), assemble the streaming audio information into frames, associate each frame with a time stamp, and transmit the resulting audio and playback timing information over the network 12. The zone player 11(n') will perform these operations in the same manner as described above, except that, instead of using the time indicated by its digital to analog converter clock 34 directly in generating the time stamps for the frames, the initial time stamp will be related to the value of the time stamp that is provided by the zone player 11(n) (reference item (b) above), with the rate at which the time stamps are incremented corresponding to the rate at which its (that is, the zone player 11(n')'s) clock increments. In addition, the zone player 11(n') will notify the zone players that are operating as the master device 21 and slave devices 22(g) of the synchrony group 20 that it is the new audio information channel device 23 for the synchrony group 20, and provide the multi-cast address that it will be using to multi-cast the audio and playback timing information, as well as its unicast network address. After the members of the synchrony group 20 receive the notification from the zone player 11(n') indicating that it is the new audio information channel device 23 for the synchrony group 20, they will receive the audio and playback timing information from the zone player 11(n') instead of the zone player 11(n), using the multi-cast address provided by the zone player 11(n'). In addition, they can utilize the zone player 11(n')'s unicast network address to obtain current time information therefrom. It will be appreciated that the zone player 11(n') will determine its current time in relation to the time stamp that is provided by the zone player 11(n) (reference item (b) above) or the current time information that it received from the zone player 11(n) using the SNTP protocol as described above.

**[0045]** Generally similar operations can be performed in connection with migrating the audio information channel device from one zone player 11(n) to another zone player 11(n') if the audio information is from one or more audio information files, such as may be the case if the audio information comprises MP3 or WAV files that are available from sources such as sources 16(m) connected to the network 12 or over from sources available over a wide area network such as the Internet, except for differences to accommodate the fact that the audio information is in files. In that case, the zone player 11(n) that is currently operating as the audio information channel device 23 for the synchrony group 20 can provide the following information to the zone player 11(n') that is to become the audio information channel device 23 for the synchrony group 20:

(d) a list of the audio information files containing the audio information that is to be played;
(e) the identification of the file for which the zone player 11(n) is currently providing audio and playback timing information, along with the offset into the file for which the current item of audio and playback timing information is being generated and the time stamp that the zone player 11(n) is associating with that frame, and
(f) the identifications of the zone players that comprise the master device 21 and slave devices 22(g) comprising the synchrony group 20.

After the zone player 11(n') receives the information from the zone player 11(n), it will begin retrieving audio information from the file identified in item (e), starting at the identified offset. In addition, the zone player 11(n') can assemble the retrieved audio information into frames, associate each frame with a time stamp and transmit the resulting audio and playback timing information over the network 12. The zone player 11(n') will perform these operations in the same manner as described above, except that, instead of using the time indicated by its digital to analog converter clock 34 directly in generating the time stamps for the frames, the value of the initial time stamp will be related to the time stamp that is provided by the zone player 11(n) (reference item (e) above), with the rate at which the time stamps are incremented corresponding to the rate at which its (that is, the zone player 11(n') 's) clock increments. In addition, the zone player 11(n') will notify the zone players that are operating as the master device 21 and slave devices 22(g) of the synchrony group 20 that it is the new audio information channel device 23 for the synchrony group 20, and provide the multi-cast address that it will be using to multi-cast the audio and playback timing information, as well as its unicast network address. After the members of the synchrony group 20 receive the notification from the zone player 11(n') indicating that it is the new audio information channel device 23 for the synchrony group 20, they will receive the audio and playback timing information from the zone player I 11(n') instead of the zone player I 11(n), using the multi-cast address provided by the zone player 11(n'). In addition, they can utilize the zone player 11(n')'s unicast network address to obtain current time information therefrom. It will be appreciated that the zone player I 11(n') will determine its current time in relation to the time stamp that is provided by the zone player 11(n) (reference item (b) above) or the current time information that it received from the zone player 11(n) using the SNTP protocol as described above. The zone player 11(n') will process successive audio information files in the list that it receives from the zone player 11(n) (reference item (d)).

**[0046]** Operations performed by the zone players 11(n) and 11(n') in connection with migration of the audio information channel device 23 for other types of audio information will be apparent to those skilled in the art. In any case, preferably, the zone player 11(n) will continue operating as an audio information channel device 23 for the synchrony group 20 for at least a brief time after it notifies the zone player 11(n') that it is to become audio information channel device for the synchrony group, so that the zone player 11(n') will have time to notify the zone players in the synchrony group 20 that it is the new audio information channel device 23 for the synchrony group.

**[0047]** Before proceeding further in describing operations performed by the network audio system 10, it would be helpful to provide a detailed description of a zone player 11(n) constructed in accordance with the invention. FIG. 3 depicts a functional block diagram of a zone player 11(n) constructed in accordance with the invention. All of the zone players in the network audio system 10 may have similar construction. With reference to FIG. 3, the zone player 11(n) includes an audio information source interface 30, an audio information buffer 31, a playback scheduler 32, a digital to analog converter 33, an audio amplifier 35, an audio reproduction device interface 36, a network communications manager 40, and a network interface 41, all of which operate under the control of a control module 42. The zone player 11(n) also has a device clock 43 that provides timing signals that control the general operations of the zone player 11(n). In addition, the zone player 11(n) includes a user interface module interface 44 that can receive control signals from the user interface module 13 (FIGS. 1 and 2) for controlling operations of the zone player 11(n), and provide status information to the user interface module 13.

**[0048]** Generally, the audio information buffer 31 buffers audio information, in digital form, along with playback timing information. If the zone player 11(n) is operating as the audio information channel device 23 (FIG. 2) for a synchrony group 20, the information that is buffered in the audio information buffer 31 will include the audio and playback timing information that will be provided to the devices 21 and 22(g) in the synchrony group 20. If the zone player 11(n) is operating as the master device 21 or a slave device 22(g) for a synchrony group, the information that is buffered in the audio information buffer 31 will include the audio and playback timing information that the zone player 11(n) is to play.

**[0049]** The audio information buffer 31 can receive audio and playback timing information from two sources, namely, the audio information source interface 30 and the network communications manager 40. In particular, if the zone player 11(n) is operating as the audio information channel device 23 for a synchrony group 20, and if the audio information source is a source 14(n)(s) connected to the zone player I 11(n), the audio information buffer 31 will receive and buffer audio and playback timing information from the audio information source interface 30. On the other hand, if the zone player 11(n) is operating as the audio information channel device 23 for a synchrony group 20, and if the audio information source is a source 16(m) connected to the network 12, or a source available over the wide area network, the audio information buffer 31 will receive and buffer audio and playback timing information from the network communications manager 40. It will be appreciated that, if the zone player 11(n) is not a member of the synchrony group, the zone player 11(n) will not play this buffered audio and playback timing information.

**[0050]** On yet another hand, if the zone player 11(n) is operating as the master device 21 or a slave device 22(g) in a synchrony group, and if the zone player 11(n) is not also the audio information channel device 23 providing audio and playback timing information for the synchrony group 20, the audio information buffer 31 will receive and buffer audio and playback timing information from the network communications manager 40.

**[0051]** The audio information source interface 30 connects to the audio information source(s) 14(n)(s) associated with the zone player 11(n). While the zone player 11(n) is operating as audio information channel device 23 for a synchrony group 20, and if the audio information is to be provided by a source 14(n)(s) connected to the zone player 11(n), the audio information source interface 30 will selectively receive audio information from one of the audio information source(s) 14(n)(s) to which the zone player is connected and store the audio information in the audio information buffer 21. If the audio information from the selected audio information source 14(n)(s) is in analog form, the audio information source interface 30 will convert it to digital form. The selection of the audio information source 14(n)(s) from which the audio information source interface 30 receives audio information is under control of the control module 42, which, in turn, receives control information from the user interface module through the user interface module interface 44. The audio information source interface 30 adds playback timing information to the digital audio information and buffers the combined audio and playback timing information in the audio information buffer 21.

**[0052]** More specifically, as noted above, the audio information source interface 30 receives audio information from an audio information source 14(n)(s), converts it to digital form if necessary, and buffers it along with playback timing information in the audio information buffer 21. In addition, the audio information source interface 30 will also provide formatting and scheduling information for the digital audio information, whether as received from the selected audio information source 14(n)(s) or as converted from an analog audio information source. As will be made clear below, the formatting and scheduling information will control not only playback by the zone player 11(n) itself, but will also enable other zone players 11(n'), 11(n"),... that may be in a synchrony group for which the zone player 11(n) is the master device, to play the audio program associated with the audio information in synchrony with the zone player 11(n).

**[0053]** In one particular embodiment, the audio information source interface 30 divides the audio information associated with an audio work into a series of frames, with each frame comprising digital audio information for a predetermined period of time. As used herein, an audio track may comprise any unit of audio information that is to be played without interruption. On the other hand, an audio program may comprise a series of one or more audio tracks that are to be played in succession. It will be appreciated that the tracks comprising the audio program may also be played without interruption, or alternatively playback between tracks maybe interrupted by a selected time interval. FIG. 4 schematically depicts an illustrative framing strategy used in connection with one embodiment of the invention for a digital audio stream comprising an audio work. More specifically, FIG.4 depicts a framed digital audio stream 50 comprising a sequence of

frames 51(1) through 51(F) (generally identified by reference numeral 51(f)). Each frame 51(f), in turn, comprises a series of audio samples 52(f)(1) through 52(f)(S) (generally identified by reference numeral 52(f)(s)) of the audio track. Preferably all of the frames will have the same number "S" of audio samples, although it will be appreciated from the following that that is primarily for convenience. On the other hand, it will be appreciated that, the number of audio samples may differ from "S"; this may particularly be the case if the frame 51(f) contains the last audio samples for the digital audio stream for a particular audio work. In that case, the last frame 51(F) will preferably contain samples 52(F)(1) through 52(F)(x), where "x" is less than "S." Generally, it is desirable that the number of samples be consistent among all frames 51(f), and in that case padding, which will not be played, can be added to the last frame 51(F).

**[0054]** Associated with each frame 51(f) is a header 55(f) that includes a number of fields for storing other information that is useful in controlling playback of the audio samples in the respective frame 51(f). In particular, the header 55(f) associated with a frame 51(f) includes a frame sequence number field 56, an encoding type field 57, a sampling rate information field 58, a time stamp field 60, an end of track flag 61, and a length flag field 62. The header 55(f) may also include fields (not shown) for storing other information that is useful in controlling playback. Generally, the frame sequence number field 56 receives a sequence number "f" that identifies the relative position of the frame 51(f) in the sequence of frames 51(1)..51(f)...51(F) containing the digital audio stream 50. The encoding type field 57 receives a value that identifies the type of encoding and/or compression that has been used in generating the digital audio stream. Conventional encoding or compression schemes include, for example, the well-known MP3 and WAV encoding and/or compression schemes, although it will be appreciated that other schemes may be provided for as well. The sampling rate information field 58 receives sampling rate information that indicates the sampling rate for the audio samples 52(f)(s). As will be apparent to those skilled in the art, the sampling rate determines the rate at which the zone player 11(n) is to play the audio samples 52(f)(s) in the frame, and, as will be described below, determines the period of the digital to analog converter clock 34.

**[0055]** The condition of the end of work flag 61 indicates whether the frame 51(f) contains the last digital audio samples for the audio track associated with the framed digital audio work 50. If the frame 51(f) does not contain the audio samples that are associated with the end of the digital audio stream 50 for a respective audio work, the end of work flag will be clear. On the other hand, if the frame 51(f) does contain the audio samples that are associated with the end of the digital audio stream 50 for a respective audio work, the end of work flag 61 will be set. In addition, since the number of valid audio samples 52(F)(s) in the frame 51(F), that is, the samples that are not padding, may be less than "S," the default number of audio samples in a frame 51(f), the length flag field 62 will contain a value that identifies the number of audio samples in 52(F)(s) in the last frame 51(F) of the audio work 50. If, as noted above, the frames have a consistent number "S" of samples, the samples 52(F)(x+1) through 52(F)(S) will contain padding, which will not be played.

**[0056]** The time stamp field 60 stores a time stamp that identifies the time at which the zone player 11(n) is to play the respective frame. More specifically, for each frame of a framed digital audio stream 50 that is buffered in the audio information buffer 21, the audio information source interface 30, using timing information from the digital to analog converter clock 34, will determine a time at which the zone player 11(n) is to play the respective frame, and stores a time stamp identifying the playback time in the time stamp field 60. The time stamp associated with each frame will later be used by the playback scheduler 32 to determine when the portion of the digital audio stream stored in the frame is to be coupled to the digital to analog converter 33 to initiate play back. It will be appreciated that the time stamps that are associated with frames in sequential frames 51(1), 51(2),..., 51(F), will be such that they will be played back in order, and without an interruption between the sequential frames comprising the digital audio stream 50. It will further be appreciated that, after a time stamp has been determined for the first frame, stored in frame 51(1), of a digital audio stream 50, the audio information source interface 30 can determine time stamps for the subsequent frame 51(2), 51(3),...., 51 (F) in relation to the number of samples "S" in the respective frames and the sample rate. The time stamps will also preferably be such that frames will be played back after some slight time delay after they have been buffered in the audio information buffer 21; the purpose for the time delay will be made clear below.

**[0057]** Returning to FIG. 3, in addition to dividing the digital audio information into frames, the audio information source interface 30 also aggregates and/or divides the frames 51(f) as necessary into packets, each of which will be of a length that would fit into a message for transmission over the network, and associates each packet with a packet sequence number. For example, if a packet will accommodate multiple frames 51(f), 51(f+1),... 51(f+y-1), it will aggregate them into a packet and associate them with a packet number, for example p(x). If the entire frames 51(f) and 51(f+y-1) was accommodated in packet p(x), where "x" is the sequence number, which will occur if the size of a packet is an exact multiple of the frame size, the next packet, p(x+1) will begin with frame 51(f+y) and will include frames 51(f+y),..., 51(f+2y-1). Subsequent packets p(x+2),.... will be formed in a similar manner. On the other hand, if the packet length will not accommodate an exact multiple of the frame size, the last frame in the packet will be continued at the beginning of the next packet.

**[0058]** If the audio information source interface 30 is aware of track boundaries, which may be the case if the tracks are divided into files, the packets will reflect the track boundaries, that is, the packets will not contain frames from two tracks. Thus, if the last frames associated with a track are insufficient to fill a packet, the packet will contain padding

from the last frame associated with the track to the end of the packet, and the next packet will begin with the first frames associated with the next track.

**[0059]** In one embodiment, the audio information source interface 30 stores the packets in the audio information buffer 31 in a ring buffer. As is conventional, a ring buffer includes a series of storage locations in the buffer. Each entry will be sufficient to store one packet. Four pointers are used in connection with the ring buffer, a first pointer pointing to the beginning of the ring buffer, a second pointer pointing to the end of the ring buffer, an third "write" pointer pointing to the entry into which a packet will be written and a fourth "read" pointer pointing to the entry from which packet will be read for use in playback. When a packet is read from the ring buffer for playback, it will be read from the entry pointed to by the read pointer. After the packet has been read, the read pointer will be advanced. If the read pointer points beyond the end of the ring buffer, as indicated by the end pointer, it will be reset to point to the entry pointed to by the beginning pointer, and the operations can be repeated.

**[0060]** On the other hand, when the audio information source interface 30 stores a packet in the ring buffer, first determine whether the entry pointed to by the write pointer points to the same entry as the entry pointed to by the read pointer. If the write pointer points to the same entry as the entry pointed to by the read pointer, the entry contains at least a portion of a packet that has not yet been read for playback, and the audio information source interface 30 will delay storage of the packet until the entire packet has been read and the read pointer advanced. After the read pointer has been advanced, the audio information source interface 30 can store the packet in the entry pointed to by the write pointer. After the packet has been stored, the audio information source interface 30 will advance the write pointer. If the write pointer points beyond the end of the ring buffer, as indicated by the end pointer, it will be reset to point to the entry pointed to by the beginning pointer, and the operations can be repeated.

**[0061]** As noted above, the zone player 11(n) can operate both as an audio information channel device 23 and a member of the synchrony group 20 of which it is a member. In that case, the audio information buffer 31 can contain one ring buffer. On the other hand, the zone player 11(n) can operate as an audio information channel device 23 for one synchrony group 20(1) (FIG. 2A) and a member of another synchrony group 20(2). In that case, the audio information buffer 31 would maintain two ring buffers, one for the audio and timing information associated with synchrony group 20(1), and the other for the audio and timing information associated with synchrony group 20(2). It will be appreciated that, in the latter case, the zone player 11(n) will only use the audio and timing information that is associated with synchrony group 20(2) for playback.

**[0062]** The playback scheduler 32 schedules playback of the audio information that is buffered in the audio information buffer 31 that is to be played by the zone player 11(n). Accordingly, under control of the playback scheduler 32, the digital audio information that is buffered in the audio information buffer 21 that is to be played by the zone player 11(n) is transferred to the digital to analog converter 33 for playback. As noted above, if the zone player 11(n) is operating as an audio information channel device 23 for a synchrony group 20 for which it is not a member, the playback scheduler 32 will not schedule the digital audio information that is to be played by that synchrony group 20 for playback. The playback scheduler 32 only schedules the digital audio information, if any, that is buffered in the audio information buffer 31 that is associated with a synchrony group for which the zone player 11(n) is a member, whether as master device 21 or a slave device 22(g).

**[0063]** Essentially, the playback scheduler 32 makes use of the read pointer associated with the circular buffer that contains the audio and playback timing information that is to be played by the zone player 11(n). The playback scheduler 32 retrieves the packet information from the entry of the ring buffer pointed to by the read pointer, and then advances the ring pointer as described above. The playback scheduler 32 determines the boundaries of the frames in the packet and uses the time stamps in the time stamp fields 60 associated with the respective frame 51(f), along with timing information provided by the zone player 11(n)'s digital to analog converter clock 34, to determine when the respective frame is to be transferred to the digital to analog converter 33. Generally, when the time stamp associated with a buffered digital audio information frame corresponds to the current time as indicated by the digital to analog converter clock 34, the playback scheduler 32 will enable the respective frame to be transferred to the digital to analog converter 33.

**[0064]** The digital to analog converter 33, also under control of the digital to analog converter clock 34, converts the buffered digital audio information to analog form, and provides the analog audio information to the audio amplifier 35 for amplification. The amplified analog information, in turn, is provided to the audio reproduction devices 15(n)(r) through the audio reproduction device interface 36. The audio reproduction devices 15(n)(r) transform the analog audio information signal to sound thereby to provide the audio program to a listener. The amount by which the audio amplifier 35 amplifies the analog signal is controlled by the control module 42, in response to volume control information provided by the user through the user interface module 13.

**[0065]** The network communications manager 40 controls network communications over the network 12, and the network interface 41 transmits and receives message packets over the network 12. The network communications manager 40 generates and receives messages to facilitate the transfer of the various types of information described above in connection with FIG. 2, including the channel device control information, slave device control information, audio and playback timing information and the audio information channel device's clock timing information. In connection with the

channel device control information and the slave device control information, the network communications manager 40 will generate messages for transfer over the network 12 in response to control information from the control module 42. Similarly, when the network communications manager 40 receives messages containing channel device control information and slave device control information, the network communications manager will provide the information to the control module 42 for processing.

**[0066]** With regards to the audio information channel device's clock timing information, as noted above, the master device 21 and slave devices 22(g) of the synchrony group 20 obtain the clock timing information from the audio information channel device 23 using the well-known SNTP. If the zone player 11(n) is operating as the audio information channel device 23 for a synchrony group, during the SNTP operation, it will provide its current time, particularly a current time as indicated by its digital to analog converter clock 34. On the other hand, if the zone player 11(n) is operating as the master device 21 or slave device 22(g) of a synchrony group 20, it will receive the clock timing information from the audio information channel device 23. After the respective device 21, 22(g) has obtained the audio information channel device's clock timing information, it will generate a differential time value AT representing the difference between the time T indicated by its digital to analog converter clock 34 and the current time information from the audio information channel device 23. The differential time value will be used to update the time stamps for the frames of the digital audio stream 50 (FIG. 4) that are received from the audio information channel device.

**[0067]** With regards to the audio and playback timing information, operations performed by the network communications manager 40 will depend on whether

(i) the audio and playback timing information has been buffered in the audio information buffer 31 for transmission, as audio information channel device 23, over the network 12 to the master device 21 and/or slave devices 22(g) of a synchrony group, or
(ii) the audio and playback timing information has been received from the network 12 to be played by the zone player 11(n) as either the master device 21 for a synchrony group or a slave device in a synchrony group.

**[0068]** It will be appreciated that the network communications manager 40 may be engaged in both (i) and (ii) contemporaneously, since the zone player 11(n) may operate both as the audio information channel device 23(1) for a synchrony group 20(1) (reference FIG. 2A) of which it is not a member, and a member of another synchrony group 20(2) for which another zone player 11(n') is the audio information channel device 23(2). With reference to item (i) above, after a packet that is to be transmitted has been buffered in the respective ring buffer, the network communications manager 40 retrieves the packet, packages it into a message and enables the network interface 41 to transmit the message over the network 12. If the control module 42 receives control information from the user interface module 13 (if the master device 21 is also the audio information channel device 23 for the synchrony group 20) or from the master device (if the master device 21 is not the audio information channel device 23 for the synchrony group 20) that would require the transmission of a "resynchronize" command as described above, the control module 42 of the audio information channel device 23 enables the network communications manager 40 to insert the command into a message containing the audio and playback timing information. Details of the operations performed in connection with the "resynchronize" command will be described below. As noted above, the "resynchronize" command is used if the user enables a synchrony group to terminate the playback of a track that is currently being played, or cancel playback of a track whose playback has not begun.

**[0069]** On the other hand, with reference to item (ii) above, if network interface 41 receives a message containing a packet containing frames of audio and playback timing information that the zone player 11(n) is to play either as a master device 21 or a slave device for a synchrony group 20, the network interface 41 provides the audio and playback timing information to the network communications manager 40. The network communications manager 40 will determine whether the packet contains a resynchronize command and, if so, notify the control module 42, which will enable operations to be performed as described below. In any case, the network communications manager 40 will normally buffer the various frames comprising the audio and playback timing information in the audio information buffer 31, and in that operation will generally operate as described above in connection with the audio information source interface 30. Before buffering them, however, the network communications manager 40 will update their time stamps using the time differential value described above. It will be appreciated that the network communications manager 40 will perform similar operations whether the messages that contain the packets were multi-cast messages or unicast messages as described above

**[0070]** The updating of the time stamps by the master device 21 and the slave devices 22(g) in the synchrony group 20 will ensure that they all play the audio information synchronously. In particular, after the network communications manager 40 has received a frame 51(f) from the network interface 41, it will also obtain, from the digital to analog converter clock 34, the zone player 11(n)'s current time as indicated by its digital to analog converter clock 34. The network communications manager 40 will determine a time differential value that is the difference between the slave device's current clock time, as indicated by its digital to analog converter 34, and the audio information channel device's time as indicated by the audio information channel device's clock timing information. Accordingly, if the master or slave

device's current time has a value $T_S$ and the audio information channel device's current time, as indicated by the clock timing information, has a value $T_C$, the time differential value $\Delta T=T_S-T_C$. If the current time of the master or slave device in the synchrony group 20, as indicated by its digital to analog converter clock 34, is ahead of the audio information channel device's clock time as indicated by the clock timing information received during the SNTP operation, the time differential value will have a positive value. On the other hand, if the master or slave device's current time is behind the audio information channel device's clock time, the time differential value $\Delta T$ will have a negative value. If the zone player 11(n) obtains clock timing information from the audio information channel device 23 periodically while it is a member of the synchrony group 20, the network communications manager 40 can generate an updated value for the time differential value AT when it receives the clock timing information from the audio information channel device 23, and will subsequently use the updated time differential value.

**[0071]** The network communications manager 40 uses the time differential value AT that it generates from the audio information channel device timing information and zone player 11(n)'s current time to update the time stamps that will be associated with the digital audio information frames that the zone player 11(n) receives from the audio information channel device. For each digital audio information frame that is received from the audio information channel device, instead of storing the time stamp that is associated with the frame as received in the message in the audio information buffer 21, the network communications manager 40 will store the updated time stamp with the digital audio information frame. The updated time stamp is generated in a manner so that, when the zone player 11(n), as a member of the synchrony group plays back the digital audio information frame, it will do so in synchrony with other devices in the synchrony group.

**[0072]** More specifically, after the zone player 11(n)'s network interface 41 receives a message containing a packet that, in turn, contains one or more frames 51(f), it will provide the packet to the network communications manager 40. For each frame 51(f) in the packet that the network communications manager 40 receives from the network interface 41, the network communications manager 40 will add the time differential value AT to the frame's time stamp, to generate the updated time stamp for the frame 51(f), and store the frame 51(f), along with the header 55(f) with the updated time stamp in the audio information buffer 31. Thus, for example, if a frame's time stamp has a time value $T_F$, the network communications manager 40 will generate an updated time stamp $T^U_F$ having a time value $T^U_F=T_F+\Delta T$. Since time value $T^U_F$ according to the slave device's digital to analog converter clock 34 is simultaneous to the time value $T_F$ according to the audio information channel device's digital to analog converter clock 34, the zone player 11(n) device will play the digital audio information frame at the time determined by the audio information channel device 23. Since all of the members of the synchrony group 20 will perform the same operations, generating the updated time stamps $T^U_F$ for the various frames 51(f) in relation to their respective differential time values, all of the zone players 11(n) in the synchrony group 20 will play them synchronously. The network communications manager 40 will generate updated time stamps $T^U_F$ for all of the time stamps 60 in the packet, and then store the packet in the audio information buffer 31.

**[0073]** It will be appreciated that, before storing a packet in the audio information buffer 21, the network communications manager 40 can compare the updated time stamps $T^U_F$ associated with the frames in the packet to the slave device's current time as indicated by its digital to analog converter clock 34. If the network communications manager 40 determines the time indicated by the updated time stamps of frames 51(f) in the packet are earlier than the zone player's current time, it can discard the packet instead of storing it in the audio information buffer 21, since the zone player 11(n) will not play them. That is, if the updated time stamp has a time value $T^U_F$ that identifies a time that is earlier than the zone player's current time $T_S$ as indicated by the zone player's digital to analog converter clock 34, the network communications manager 40 can discard the packet.

**[0074]** If the zone player 11(n) is operating as the master device 21 of a synchrony group 20, when the user, through the user interface module 13, notifies the zone player 11(n) that another zone player 11(n') is to join the synchrony group 20 as a slave device 22(g), the control module 42 of the zone player 11(n) enables the network communications manager 40 to engage in an exchange of messages, described above in connection with FIG. 2, to enable the other zone player 11(n') to join the synchrony group 20 as a slave device. As noted above, during the message exchange, the messages generated by the network communications manager 40 of the zone player 11(n) will provide the network communications manager of the zone player 11(n') that is to join the synchrony group 20 with information such as the multi-cast address being used by the audio information channel device 23 that is providing the audio program to the synchrony group 20, as well as a unicast network address for the audio information channel device 23. After receiving that information, the network communications manager and network interface of the zone player 11(n') that is to join the synchrony group 20 can begin receiving the multi-cast messages containing the audio program for the synchrony group, engage in SNTP transactions with the audio information channel device 23 to obtain the latter's current time, and also enable the audio information channel device 23 to send the zone player 11(n') frames 51(f) that it had previously broadcast using the unicast message transmission methodology as described above.

**[0075]** On the other hand, if the network communications manager 40 and network interface 41 of the zone player 11(n) receive a message over the network 12 indicating that it is to become a slave device 22(g) of a synchrony group for which another zone player 11(n') is the master device, the network communications manager 40 for zone player

11(n) will provide a notification to the control module 42 of zone player 11(n). Thereafter, the control module 42 of zone player 11(n) can enable the network communications manager 40 of zone player 11(n) to perform the operations described above to enable it to join the synchrony group 20.

**[0076]** As noted above, the user, using user interface module 13, can enable the synchrony group to terminate playback of a track of an audio program that is currently being played. After playback of a track that is currently being played has been terminated, playback will continue in a conventional manner with the next track that has been buffered in the audio information buffer 31. It will be appreciated that that could be the next track that is on the original play list, or a previous track. In addition, the user can enable the synchrony group 20 to cancel playback of a track that it has not yet begun to play, but for which buffering of packets has begun in the synchrony group 20. Both of these operations make use of the "resynchronize" command that the master device 21 of the synchrony group 20 can enable the audio information channel device 23 to include in the multi-cast message stream that it transmits to the synchrony group 20. Generally, in response to receipt of the resynchronize command, the members of the synchrony group 20 flush the ring buffer containing the packets that they are to play in the future. In addition, if the members of the synchrony group provide separate buffers for their respective digital to analog converters 33, the members will also flush those buffers as well. After the audio information channel device transmits a packet containing the resynchronize command:

(i) in the case of the use of the resynchronize command to terminate playing of a track that is currently being played, the audio information channel device 23 will begin multi-casting packets for the next track, to begin play immediately, and will continue through the play list in the manner described above; and

(ii) in the case of the use of the resynchronize command to cancel play of a track for which buffering has begun, but which is to be played in the future, the audio information channel device 23 will begin multi-casting packets for the track after the track that has been cancelled, to be played beginning at the time the cancelled track was to begin play, and will also continue through the play list in the manner described above.

It will be appreciated that,

(a) in the first case (item (i) directly above), the resynchronize command can enable the read pointer to be set to point to the entry in the circular buffer into which the first packet for the next track will be written, which will correspond to the entry to which the write pointer points, but

(b) in the second case (item (ii) directly above), the resynchronize command can enable the write pointer for the circular buffer to be set to point to the entry that contains the first packet for the track whose play is being cancelled.

It will further be appreciated that, if a track is cancelled for which buffering has not begun, the resynchronize command will generally not be necessary, since the audio information channel device 23 for the synchrony group 20 need only delete that track from the play list.

**[0077]** Operations performed in connection with use of the resynchronize command to cancel playback of a track that is currently being played will be described in connection with Packet Sequence A below, and operations performed in connection with the use of the resynchronize command to cancel playback of a track that is has not yet begun to play, but for which buffering of packets has begun, will be described in connection with Packet Sequence B below.

Packet Sequence A

**[0078]**

(A1.0) [packet 57]
(A1.1) [continuation of frame 99]
(A1.2) [frame 100, time = 0:00:01, type = mp3 audio]
(A1.3) [frame 101, time = 0:00:02, type = mp3 audio]
(A1.4) [frame 102, time = 0:00:03, type = mp3 audio]

(A2.0) [packet 58]
(A2.1) [continuation of frame 102]
(A2.2) [frame 103, time = 0:00:04, type = mp3 audio]
(A2.3) [frame 104, time = 0:00:05, type = mp3 audio]
(A2.4) [frame 105, time = 0:00:06, type = mp3 audio]

(continued)

(A3.0) [packet 59]
(A3.1) [continuation of frame 105]
(A3.2) [frame 106, time = 0:00:07, type = mp3 audio]
(A3.3) [frame 107, time = 0:00:08, type = mp3 audio]
(A3.4) [frame 108, time = 0:00:09, type = mp3 audio]
(A4.0) [packet 60]
(A4.1) [continuation of frame 108]
(A4.2) [frame 109, time = 0:00:10, type = mp3 audio]
(A4.3) [Resynchronize command]
(A4.4) [Padding, if necessary]

(A5.0) [packet 61]
(A5.1) [frame 1, time = 0:00:07, type = mp3 audio]
(A5.2) [frame 2, time = 0:00:08, type = mp3 audio]
(A5.3) [frame 3, time = 0:00:09, type = mp3 audio]
(A5.4) [frame 4, time = 0.00.10, type = mp3 audio]

(A6.0) [packet 62]
(A6.1) [continuation of frame 4]
(A6.2) [frame 5, time = 0:00:11, type = mp3 audio]
(A6.3) [frame 6, time = 0:00:12, type = mp3 audio]
(A6.4) [frame 7, time = 0:00:13, type = mp3 audio]

**[0079]** Packet Sequence A comprises a sequence of six packets, identified by packet 57 through packet 62, that the audio information channel device 23 multi-casts in respective messages to the members of a synchrony group 20. It will be appreciated that the series of messages that the audio information channel device 23 may multi-cast to the synchrony group 20 may include a messages prior to the packet 57, and may also include messages after packet 62. Each packet comprises a packet header, which is symbolized by lines (A1.0), (A2.0),...(A6.0) in Packet Sequence A, and will generally also include information associated with at least a portion of a frame. In the packets represented in Packet Sequence A, each packet includes information associated with a plurality of frames. Depending on the lengths of the packets, each packet may contain information associated with a portion of a frame, an entire frame, or multiple frames. In the illustration represented by Packet Sequence A, it is assumed that each packet may contain information associated with multiple frames. In addition, it is assumed that a packet does not necessarily contain information associated with an integral number of frames; in that case, a packet may contain information associated with a portion of a frame, and the next packet will contain the information associated with the rest of a frame.

**[0080]** The frames and associated header playback timing information contained in the various packets are symbolized by lines (A1.1), (A1.2),..., (A1.4), (A2.1),.... (A6.4) of Packet Sequence A. Thus, for example, line (A1.2) of packet 57 represents the one-hundredth frame, that is, frame 51(100) (reference FIG.4), of the track whose audio information is being transmitted in the sequence of packets that includes packet 57. The frame 51 (100) is to be played at an illustrative time, according to the audio information channel device's digital to analog converter clock, of "time=0:00:01," and the frame is encoded and/or compressed using the well-know MP3 encoding and compression methodology. In that case, the legend "time = 0:00:01" represents the time stamp that would be included in field 60 (FIG. 4) of the header associated with the frame 50(100) as multi-cast by the audio information channel device for the synchrony group. It will be appreciated that the playback time and encoding/compression methodology will be referred in the header 55(100) that is associated with the frame 51(100). It will also be appreciated that the header may also contain additional information as described above.

**[0081]** Similarly, line (A1.3) of packet 57 represents the one-hundred and first frame, that is, frame 51(101), of the track whose audio information is being transmitted in the sequence of packets that includes packet 57. The frame 51(101) is to be played at an illustrative time, according to the audio information channel device's digital to analog converter clock, of "0:00:02," and the frame is also encoded and/or compressed using the MP3 encoding and compression methodology. Line (A1.4) of packet 57 represents similar information, although it will be appreciated that, depending on the length of packet 57, the line may not represent the information for an entire frame 51(102) and/or its associated header. If the length of packet 57 is not sufficient to accommodate the information for the entire frame 51(102) and/or associated header, the information will continue in packet 58, as represented by line (A2.1) in Packet Sequence A. Similarly, if the

length of packet 56 was not sufficient to contain the information for an entire frame 51(99) preceding frame 51(100), packet 57 (lines (A1.0) through 1.4) may contain any information from frame 51 (99) that packet 56 was unable to accommodate.

**[0082]** As noted above, when the master device 21 or a slave device 22(g) in the synchrony group 20 receives the packet 57, its respective network communications manager 40 will update the time stamps associated with the various frames 51(f) as described above before buffering the respective frames in the respective audio information buffer 31.

**[0083]** Packets 58 and 59 contain information that is organized along the lines described above in connection with packet 57.

**[0084]** Packet 60 also contains, as represented by lines (A4.1) and (A4.2), information that is organized along the lines of the information represented by lines (Ax.1) and (Ax.2) ("x" equals an integer) described above in connection with packets 57 through 59. On the other hand, packet 60 contains a resynchronize command, as represented by line (A4.3). Packet 60 also may contain padding, as represented by line 4.4, following the resynchronize command. As noted above, the master device 21 of a synchrony group 20 will enable the audio information channel device 23 that is providing audio information to the synchrony group 20 to multi-cast a message containing the resynchronize command when it receives notification from the user interface module 13 that the user wishes to cancel playback of a track that is currently being played. In the example depicted in Packet Sequence A, as will be described below, the audio information channel device 23 receives notification from the master device 21 that the user wishes to cancel playback of a track at a time corresponding to "time = 0:00:07" according to its digital to analog converter clock 34, and, in line (A4.3) of packet 60 it will provide the resynchronize command, followed by padding, if necessary.

**[0085]** As will be apparent from examining lines (A3.1) through (A3.4) of packet 59 and lines (A4.1) and (A4.2) of packet 60, although the audio information channel device 23 has received the notification from the synchrony group's master device 21 to multi-cast the resynchronize command at a time corresponding to "time = 0:00:07" according to the clock time indicated by its digital to analog converter clock 34, it (that is, the audio information channel device 23) has already multi-cast messages containing frames that are to be played at that time and subsequently. That is, the audio information channel device 23 has, multi-cast in packet 59, frames 51(106) through 51(108) that contain time stamps "time = 0:00:07," "time = 0:00:08" and "time = 0:00:09," respectively, and, in packet 60, in addition to the continuation of frame 51(108), frame 51(109) that contains time stamp "time = 0:00:10." (It will be appreciated that the times indicated by the illustrative time stamps are for illustration purposes only, and that in an actual embodiment the time stamps may have different values and differentials.)

**[0086]** As noted above, the audio information channel device 23 multi-casts a message containing a packet that, in turn, contains the resynchronize command when it receives the notification from the master device 21 to do so. In the example depicted in Packet Sequence A, the packet will be multi-cast when the audio information channel device's digital to analog converter clock time corresponds to"0:00:07." Subsequently, two things happen. In one, aspect, when the master device 21 and slave devices 22(g) receive the packet that contains the resynchronize command, they will stop playing the audio program that they are playing.

**[0087]** In addition, the audio information channel device 23 will begin transmitting frames containing audio information for the next track, including therewith time stamps immediately following the digital to analog converter clock time at which the packet including the resynchronize command was transmitted. Accordingly, and with further reference to Packet Sequence A, the audio information channel device 23 will multi-cast a message containing packet 61. As indicated above, packet 61 contains, as represented in lines (A5.1) through (A5.3), frames 51(1) through 51(3), which are the first three frames of the next track of the audio program that is to be played. It is also compressed and encoded using the MP3 encoding and compression scheme, and it is accompanied by time stamps "time = 0:00:07," "time = 0:00:08" and "time = 0:00:10." As noted above, the time stamp "time=0:00:07" corresponds to the clock time at which the audio information channel device 23 multi-casts the resynchronize command, and, when the master device 21 and slave devices 22(g) receive these frames, they would be expected to begin playing them very shortly, if not immediately after the audio information channel device 23 multi-casts the message containing the packet that, in turn, contains the resynchronize command. Packet 61 also includes at least a portion of the next frame, that is, frame 51(4), for that track. In addition, Packet Sequence A depicted above further includes a subsequent packet, namely, packet 62, that contains any necessary continuation of frame 51 (4), as well as three subsequent frames. If any additional packets are required for the track, as well as for subsequent tracks, they can be multi-cast in a similar manner.

**[0088]** As further noted above, the resynchronize command can also be used to cancel playing of one or more tracks for which playback has begun. This will be illustrated in connection with Packet Sequence B :

Packet Sequence B

**[0089]**

(B1.0) [packet 157]
(B1.1) [continuation of frame 99]
(B1.2) [frame 100, time = 0:00:01, type = mp3 audio]
(B1.3) [frame 101, time = 0:00:02, type = mp3 audio]
(B1.4) [frame 102, time = 0:00:03, type = mp3 audio]

(B2.0) [packet 158]
(B2.1) [continuation of frame 102]
(B2.2) [frame 103, time = 0:00:04, type = mp3 audio]
(B2.3) [frame 104, time = 0:00:05, type = mp3 audio]
(B2.4) [frame 105, time = 0:00:06, type = mp3 audio]

(B3.0) [packet 159]
(B3.1) [continuation of frame 105]
(B3.2) [frame 106, time = 0:00:07, type = mp3 audio]
(B3.3) [track boundary notification]
(B3.4) [Padding, if necessary]

(B4.0) [packet 160]
(B4.1) [frame 1, time = 0:00:08, type = mp3 audio]
(B4.2) [frame 2, time = 0:00:09, type = mp3 audio]
(B4.3) [frame 3, time = 0:00:10, type = mp3 audio]

(B5.0) [packet 161]
(B5.1) [continuation of frame 3]
(B5.2) [frame 4, time = 0:00:11, type = mp3 audio]
(B5.3) [Resynchronize, after packet 159]
(B5.4) [Padding, if necessary]

(B6.0) [packet 162]
(B6.1) [frame 1, time = 0:00:08, type = mp3 audio]
(B6.2) [frame 2, time = 0:00:09, type = mp3 audio]
(B6.3) [frame 3, time = 0:00:10, type = mp3 audio]
(B6.4) [frame 4, time = 0:00:11, type = mp3 audio]

(B7.0) [packet 163]
(B7.1) [continuation of frame 4]
(B7.2) [frame 5, time = 0:00:12, type = mp3 audio]
(B7.3) [frame 6, time = 0:00:13, type = mp3 audio]
(B7.4) [frame 7, time = 0:00:14, type = mp3 audio]

**[0090]** Packet Sequence B comprises a series of seven packets, identified by packet 157 through 163 , that the audio information channel device 23 multi-casts to the members of a synchrony group 20. As with Packet Sequence A, it will be appreciated that the series of packets that the audio information channel device 23 may multi-cast to the synchrony group 20 may include packets prior to the packet 157, and may also include packets after packet 162. Each packet comprises a packet header, which is symbolized by lines (B1.0), (B2.0),... (B7.0) in Packet Sequence B. As in Packet Sequence A, each packet will also generally include information associated with at least a portion of a frame 51(f) along with its associated frame 55(f). As in the packets represented in Packet Sequence A, each packet includes information associated with a plurality of frames. Depending on the lengths of the packets, each packet may contain information associated with a portion of a frame, an entire frame, or multiple frames. Further, as with Packet Sequence A, it is assumed that each packet may contain information associated with multiple frames. In addition, it is assumed that a packet does not necessarily contain information associated with an integral number of frames; in that case, a packet

may contain information associated with a portion of a frame, and the next packet will contain the information associated with the rest of a frame.

**[0091]** The structures of the packets represented by Packet Sequence B are similar to those described above in connection with Packet Sequence A, and will not be repeated here. Generally, Packet Sequence B illustratively contains a sequence of packets that represent at least portions of three tracks that may have been selected from, for example, a play list. In particular, packets 157 through 159 represent frames from a portion of one track, packets 160 and 161 represent frames from a second track and packets 162 and 163 represent frames from a third track. The play list indicated that the first, second and third tracks were to be played in that order. With particular reference to Packet Sequence B, it should be noted that line (B3.3) indicates that packet 159 includes an indication that that packet contains the last frame for the track, and line (B3.4) provides for padding to the end of the packet. The first frame of the next track begins in packet 160.

**[0092]** In connection with the use of the resynchronize command to cancel playback of a track, at least a portion of which the audio information channel device 23 has multi-cast to the members of the synchrony group, packet 161, in line (B5.3) represents a resynchronize command that indicates that resynchronization is to occur after packet 159, that is, immediately after the packet that contains the last frame of the first of the three tracks represented by the packets in Packet Sequence B. It should be noted that the resynchronize command is in the packet 161, while the resynchronization is to occur at packet 160, that is, the synchrony group is to not play the track starting with packet 160, but instead is to begin playing the track frames for which begin with the next packet, that is, packet 162. As with Packet Sequence A, in Packet Sequence B the audio information channel device 23, in packet 162 and 163, multi-casts frames whose time stamps indicate that they are to be played when the frames that were multi-cast in packets 160 and 161 were to be played. By use of the resynchronize command and specifying a packet in this manner, the audio information channel device can cancel playback of a track for which playback has not yet begun.

**[0093]** It will be appreciated that the resynchronize command is generally not necessary for cancelling play back of a track that the audio information channel device 23 has not started multi-casting to the synchrony group 20, since the audio information channel device 23 itself can re-order the play list to accommodate the cancellation.

**[0094]** The invention provides a number of advantages. In particular, the invention provides a network audio system in which a number of devices share information can reproduce audio information synchronously, notwithstanding the fact that packets, which may contain digital audio information, transmitted over the network to the various zone players connected thereto may have differing delays and the zone players operate with independent clocks. Moreover, although the invention has been described in connection with audio information, it will be appreciated that the invention will find utility in connection with any type of isochronous information for which synchrony among devices is desired. The system is such that synchrony groups are created and destroyed dynamically, and in such a manner as to avoid requiring a dedicated device as the master device.

**[0095]** It will be appreciated that a number of changes and modifications may be made to the network audio system 10 as described above. For example, although the invention has been described as providing that the audio information channel device 23 provides digital audio information to the members synchrony group 20 that has been encoded using particular types of encoding and compression methodologies, it will be appreciated that the audio information channel device 23 can provide digital audio information to various members of the synchrony group 20 that have been encoded and compressed using different types of encoding and compression methodologies, and, moreover, for which different sampling rates have been used. For example, the audio information channel device 23 may provide digital audio information to the master device 21 and slave devices 22(1) through 22($g_1$) using the MP3 methodology at a specified sampling rate, the digital audio information for the same program to slave devices 22($g_1$+1) through 22($g_2$) using the WAV methodology at one specified sampling rate, and to slave devices 22($g_2$+1) through 22(G) using the WAV methodology at another specified sampling rate. In that case, the audio information channel device 23 can specify the particular encoding and compression methodology that has been used in the encoding type field 57 associated with each frame and the sampling rate in the sampling rate field 58. Moreover, since the encoding and compression type and sampling rate are specified for each frame, the encoding and compression type and sampling rate can be changed from frame to frame. The audio information channel device 23 may use different multi-cast addresses for the different encoding and compression types and sampling rates, but it will be appreciated that that would not be required.

**[0096]** It will be appreciated that two advantages of providing that the encoding and compression methodology and the sampling rate is provided on a frame-by-frame basis, instead of on, for example, a track-by-track basis, is that that would facilitate a slave device joining the synchrony group 20 at a frame mid-track, without requiring, for example, the master device 21 or the audio information channel device 23 to notify it of the encoding and compression methodology or the sampling rate.

**[0097]** Another modification is that, instead of the network communications manager 40 of a member of a synchrony group 20 generating the updated time stamp $T^u_F$ for a digital audio information frame by adding the time differential value AT to the time stamp $T_F$ associated with a frame, the network communications manager 40 may instead generate the updated time stamp $T^U_F$ by subtracting the differential time value AT from the member's current time $T_S$ as indicated

by the member's digital to analog converter clock 34 at the time at which the digital audio information is received. It will be appreciated, however, that there may be variable time delays in processing of messages by the slave device's network communications manager 40, and so it may be preferable to generate the time differential value AT using the time stamp $T_F$ provided by the audio information channel device 23.

**[0098]** In addition, instead of the network communications manager 40 of a member of a synchrony group generating an updated time stamp to reflect the difference between the times indicated by the member's digital to analog converter clock and the audio information channel device's digital to analog converter clock, the network communications manager 40 can generate the time differential value AT and provide it to the member's playback scheduler 32. In that case, the member's network communications manager 40 can store each digital audio information frame along with the time stamp $T_F$ as received from the master device in the audio information buffer 21. The playback scheduler 32 can utilize the time differential value $\Delta T$, and the time stamps $T_F$ associated with the digital audio information frames, to determine when the respective digital audio information frames are to be played. In determining when a digital audio information frame is to be played, the playback scheduler can add the time differential value to the time stamp $T_F$ associated with the digital audio frame, and enable the digital audio frame to be coupled to the digital to analog converter 33 when the time indicated by the sum corresponds to the current time as indicated by the slave device's digital to analog converter clock 34. Alternatively, when the member's digital to analog converter clock 34 updates its current time $T_S$, the playback scheduler can generate an updated current time $T'_S$ by subtracting the differential time value AT from the current time $T_S$, and using the updated current time $T'_S$ to determine when to play a digital audio information frame.

**[0099]** As described above, the members of a synchrony group 20 periodically obtain the audio information channel device's current time value and uses the current time value that it receives from the audio information channel device to periodically update the time differential value AT that it uses in updating the time stamps associated with the various frames. It will be appreciated that, if the digital to analog converter clock(s) associated with the member(s) of a synchrony group 20 are ensured to have the same rate as the digital to analog converter clock, a member need only obtain the current time value from the audio information channel device once, at the beginning of playback.

**[0100]** As another alternative, if the zone players are provided with digital to analog converter clock 34 whose time and rate can be set by an element such as the network communications manager 40, when a zone player 11(n) is operating as a member of a synchrony group 20, its network communications manager 40 can use the various types of timing information that it receives from the audio information channel device 23, including the current time information and the playback timing information indicated by the time stamps that are associated with the various frames 51(f) comprising the audio and playback timing information that it receives, to adjust the synchrony group member's digital to analog converter clock's time value and/or the clock rate that it uses for playback.

**[0101]** If the clock's time value is to be adjusted, when the synchrony group member's network communications manager 40 initially receives the current time information from the audio information channel device 23 for the synchrony group 20, the network communications manager 40 can set the synchrony group member's digital to analog converter clock 34 to the current time value as indicated by the audio information channel device's current time information. The network communications manager 40 can set the clock 34 to the current time value indicated by the audio information channel device's current time information once, or periodically as it receives the current time information.

**[0102]** Alternatively or in addition, the synchrony group member's network communications manager 40 can use one or both of the current time information and/or the playback timing information in the time stamps associated with the respective frames 51(f) to adjust the clock rate of the clock 34 that it uses for playback. For example, when the synchrony group member's network communications manager 40 receives a frame 51($f_X$) having a time stamp having a time value $T_{fx}$, it can generate the updated time value $T^U_{fx} = T_{fx} + \Delta T$ as described above, and store the frame
with the time stamp with the updated time value in the audio information buffer 30. In addition, since both the number of samples in a frame and the sampling rate, which determines the rate at which the frame is to be played, are known to the network communications manager 40, it can use that information, along with the updated time value $T^U_{Fx}$ that is to be used for frame 51($f_X$) to generate an expected updated time value $T^E_{fx+1}$, that is expected for the updated time stamp of the next frame 51($f_{x+1}$). After the synchrony group member's network communications manager 40 receives the next frame 51($f_{x+1}$), it can generate the updated time value $T^U_{fx+1}$ and compare that value to the expected updated time value $T^E_{fx+1}$. If the two time values do not correspond, or if
the difference between them is above a selected threshold level, the clock that is used by the audio information channel device 23 to generate the time stamps is advancing at a different rate than the synchrony group member's digital to analog converter clock 34, and so the network communications manager 40 can adjust the rate of the digital to analog converter clock 34 to approach that of the clock used by the audio information channel device 23 so that the differential time value AT is constant. On the other hand, if the two time values do correspond, then the time differential value AT is constant, or the difference is below a threshold level, and the network communications manager 40 need not change the clock rate of the digital to analog converter clock 34. It will be appreciated that, if the clock rate is to be adjusted, the rate adjustment can be fixed, or it can vary based on, for example, the difference between the updated time value $T^U_{fx+1}$, and the expected

updated time value $T^{E}_{fx+1}$.

**[0103]** It will also be appreciated that, if no rate adjustment is performed for one frame 51 ($f_{X+1}$), the synchrony group member's network communications manager 40 can generate an expected updated time value $T^{E}_{fx+2}$ that is expected for the updated time stamp of the next frame 51($f_{X+2}$) using the updated time value $T^{U}_{Fx}$ determined for frame 51($f_X$), along with the number of samples in a frame and the sampling rate, and compare the expected updated time value $T^{E}_{fx+2}$ to the updated time value $T^{U}_{fx+2}$ that it generates when it receives frame 51($f_{X+2}$). At that point, if the network communications manager 41 determines that two time values do not correspond, or if the difference between them is above a selected threshold level, it can adjust the rate of the digital to analog converter clock 34. Similar operations can be performed if no rate adjustment is performed for several successive frames 51($f_{X+1}$), 51($f_{X+2}$),.... This will accommodate the possibility that the rate differential between the clock 34 and the clock used by the audio information channel device 23 in generating the time stamps have rates that differ by an amount sufficiently small that it cannot be detected using time stamps of two or more successive frames.

**[0104]** Instead or in addition to adjusting the clock rate as described above, the synchrony group member's network communications manager 40 can perform similar operations in connection with adjusting the clock rate in connection with the current time information that it receives from the audio information channel device 23.

**[0105]** Furthermore, although the network audio system 10 has been described such that the master device 21 of a synchrony group 20 can, in response to control information provided thereto by a user through the user interface module 13, provide a notification to a zone player 11(n) that it is to become a member of its synchrony group 20 as a slave device 22(g), it will be appreciated that the user interface module 13 can provide the notification directly to the zone player 11(n) that is to become a member of the synchrony group 20. In that case, the zone player 11(n) can notify the master device 21 that it is to become a slave device 22(g) in the synchrony group 20, after which the master device 21 can provide information regarding the synchrony group 20, including the multi-cast and unicast addresses of the audio information channel device and other information as described above.

**[0106]** Similarly, although the network audio system 10 has been described such that the master device 21 of a synchrony group 20 can, in response to control information provided thereto by a user through the user interface module 13, provide a command to a slave device 22(g) to enable the slave device 22(g) to adjust its volume, it will be appreciated that the user interface module 13 can provide control information directly to the slave device 22(g) to enable the slave device 22(g) to adjust its volume.

**[0107]** In addition, although the network audio system 10 has been described such that each frames 51(f) is associated with a frame sequence number (reference field 56, FIG. 4), it will be appreciated that, if the packets described above in connection with Packet Sequence A and Packet Sequence B are provided with packet sequence numbers, the frame sequence numbers need not be provided, since the packet sequence numbers can suffice for defining the frame sequencing.

**[0108]** Furthermore, although the network audio system 10 has been described such that the zone players 11(n) are provided with an audio amplifier 35 for amplifying the analog signal provided by the respective digital to analog converters 33, it will be appreciated that a zone player may be provided that does not itself include an audio amplifier. In that case, the analog signal may be coupled to an external amplifier for amplification as necessary before being provided to the audio reproduction device(s) 15(n)(r). It will be appreciated that a single zone player 11(n) may be provided with multiple audio amplifiers and audio reproduction device interfaces, and, if necessary, multiple digital to analog converters 33, to provide audio programs for corresponding numbers of synchrony groups.

**[0109]** Similarly, although the zone players 11(n) have been described such that they may be connected to one or more audio information sources, it will be appreciated that an audio information source may form part of and be integrated into a zone player 11(n). For example, a zone player may include a compact disk player, cassette tape player, broadcast radio receiver, or the like, that has been integrated into it. In addition, as noted above, an individual zone player 11(n) may be connected to multiple audio information sources and may contemporaneously operate as the audio information channel device 23 for multiple synchrony groups.

**[0110]** In addition, although FIG. 1 shows the network audio system 10 as including one user interface module 13, it will be appreciated that the system 10 may include a plurality of user interface modules. Each user interface module be useful for controlling all of the zone players as described above, or alternatively one or more of the user interface modules may be useful for controlling selected subsets of the zone players.

**[0111]** Moreover, it will be appreciated that, although the invention has been described in connection with audio information, it will be appreciated that the invention will find utility in connection with any type of information for which synchrony among devices connected to a network is desired.

**[0112]** As noted above, while a zone player 11(n) is operating as audio information channel device 23 for a synchrony group 20, when the zone player 11(n)'s audio information source interface 30 or network communications manager 40 stores digital audio information frames based on audio information from an audio information source 14(n)(s) in the audio information buffer 31, it will provide time stamps for the respective frames to schedule them for playback after some time delay after they have been buffered in the audio information buffer 31. The delay is provided so that, for other zone

players 11(n'), 11(n''),... that are operating as members of a synchrony group, there will be sufficient time for the audio and playback timing information to be transferred over the network 12 to those other zone players 11(n'), 11(n''),... so that it can be processed and played by them at the appropriate time as described above. The time period that is selected for the time delay may be fixed or variable, and in either case may be based on a number of factors. If the time period selected for the time delay is fixed, it may be based on, for example, factors such as an estimate of the maximum latency in the network 12, the estimated maximum loading of the various components comprising the zone players 11(n), and other estimates as will be appreciated by those skilled in the art.

**[0113]** The time delay may be the same for audio information from all types of audio information sources, and may be constant over the entire period that the synchrony group 20 is playing an audio work. Alternatively, different time delays may be utilized based on various criteria. For example, if the audio information is to be played independently of information associated with other types of media, the time delay may be selected to be relatively long, on the order of a significant fraction of a second, or longer. On the other hand, if the audio information is to be played contemporaneously with, for example, video information, which may be supplied by, for example, a video disk, video tape cassette, over cable, satellite, or broadcast television, which may not be buffered or which may be displayed independently of the network audio system 10, it may be undesirable to provide for such a lengthy delay, since the time delay of the audio playback, in relation to the video display, may be noticeable. In that case, the zone player 11(n) may provide for a much shorter time delay. In one embodiment, the time delay provided for audio information to be played concurrently with video information is selected to be generally on the order of fifty milliseconds, which would barely, if at all, be perceptible to someone viewing the video. Other desirable time delays for information from other types of sources will be apparent to those skilled in the art.

**[0114]** As yet a further possibility, the zone player 11(n), when operating as an audio information channel device 23 for a synchrony group 20, can dynamically determine the time delay based on a number of conditions in the network audio system 10, including, for example, the message transfer latency in network 12, the loading of microprocessors or other components that are used in the various zone players 11(n'), 11(n''),... that may comprise a synchrony group 20, as well as other factors. For example, if the audio information channel device 23 determines that the latency in the network 12 has increased beyond a selected threshold, the audio information channel device 23 can adjust the delay to increase the likelihood that the members of the synchrony group 20 will be able to receive the packets and process the frames so that they will be able to play them at the appropriate times. Similarly, if the audio information channel device 23 is notified that a member of the synchrony group 20 to which it provides audio information requires additional time to receive and process the frames that it transmits, the audio information channel device 23 can adjust the delay accordingly. It will be appreciated that, to reduce or minimize possible discontinuities in the audio playback by the members of the synchrony group, the audio information channel device 23 can, instead of adjusting the time delay during a particular audio track, adjust the time delay between tracks, during silent periods of a track or otherwise as will be appreciated by those skilled in the art. In addition, the audio information channel device 23 can use conventional audio compression methodologies to facilitate a speeding up and/or slowing down of playback of an audio track while it is in the process of providing additional time delay. Generally, the members of the synchrony group 20 can provide notifications to the audio information channel device 23 if they determine that they will need an additional time delay, and the audio information channel device 23 can adjust the time delay in accordance with the notifications from the members of the synchrony group 20.

**[0115]** It will be appreciated that a system in accordance with the invention can be constructed in whole or in part from special purpose hardware or a general purpose computer system, or any combination thereof, any portion of which may be controlled by a suitable program. Any program may in whole or in part comprise part of or be stored on the system in a conventional manner, or it may in whole or in part be provided in to the system over a network or other mechanism for transferring information in a conventional manner. In addition, it will be appreciated that the system may be operated and/or otherwise controlled by means of information provided by an operator using operator input elements (not shown) which may be connected directly to the system or which may transfer the information to the system over a network or other mechanism for transferring information in a conventional manner.

**[0116]** The foregoing description has been limited to a specific embodiment of this invention. It will be apparent, however, that various variations and modifications may be made to the invention, with the attainment of some or all of the advantages of the invention. It is the object of the appended claims to cover these and such other variations and modifications as come within the true spirit and scope of the invention.

**[0117]** The following numbered clauses set out further exemplary embodiments of the present invention.

1. A system comprising plurality of devices, one of the devices operating as a task source device and at least one other device operating as a member of a synchrony group, A. the task source device being configured to distribute a series of tasks to the synchrony group, each task being associated with a time stamp indicating a time, relative to a clock maintained by the task source device, at which the devices comprising the synchrony group are to execute the respective task; B each member device being configured to: (i) periodically obtain from the task source device

an indication of a current time value indicated by the task source device's clock, and (ii) determine, from the time stamp associated with each respective task and a time differential value representing a difference between the current time value indicated by the task source device's clock, and a current time value indicated by its respective clock, a time, relative to its respective clock, at which it is to execute the task.

2. A system as defined in clause 1 in which the synchrony group comprises a plurality of member devices.

3. A system as defined in clause 2 in which each device comprising a, member of the synchrony group is further configured to execute each task that it receives from the task source device at the determined time, thereby to facilitate execution by them of respective tasks in the series in respective timing relationships relative to the time indicated by the task source device's clock.

4. A system as defined in clause 3 in which the member devices are configured to execute respective tasks in synchrony.

5. A system as defined in clause 2 in which one of the member devices operates as a master device for the synchrony group, any other member devices comprising respective slave devices, the master device being configured to perform at least one type of synchrony group management operation in connection with the member devices comprising the synchrony group.

6. A system as defined in clause 5 further including a user interface module configured to control the master device's performance of said at least one type of synchrony group management operation, the master device being further configured to provide status information relating to the status of the synchrony group to the user interface module.

7. A system as defined in clause 6 in which the status information includes identifications of the devices comprising the synchrony group.

8. A system as defined in clause 6 in which the status information includes an identification of the task currently being executed.

9. A system as defined in clause 5, the system comprising at least one additional device, in which, in one type of synchrony group management operation, the master device is configured to enable the at least one additional device to join the synchrony group as a slave device.

10. A system as defined in clause 9 in which the task source device is configured to distribute tasks to the member devices using a selected multi-cast transmission methodology, the member devices being configured to buffer the tasks until they are to be executed, and further in which, when the at least one additional device joins the synchrony group as a slave device, the task source device is enabled to transmit at least one previously distributed task to the slave device using a selected unicast transmission methodology.

11. A system as defined in clause 5 in which, in at least one type of synchrony group management operation, the master device is configured to enable the task source device to join the synchrony group as a slave device, the task source device continuing to operate as the task source device for the synchrony group.

12. A system as defined in clause 5 in which, in at least one type of synchrony group management operation, the master device is configured to enable a slave device to disengage from the synchrony group, the disengaged slave device thereafter not being a member device in the synchrony group.

13. A system as defined in clause 5 in which, in at least one type of synchrony group management operation, the master device is configured to control the series of tasks to be distributed by the task source device.

14. A system as defined in clause 5 in which, in at least one type of synchrony group management operation, the master device is further configured to control execution by the member devices of the tasks that have been distributed by the task source device.

15. A system as defined in clause 14 in which the series of tasks includes a series of task sequences with each task sequence including a sub-set of the series of tasks, and further in which in at least one type of synchrony group management operation, the master device is configured to enable the member devices to terminate execution of a task sequence that is currently being executed.

16. A system as defined in clause 15 in which, in the synchrony group management operation enabling the member devices to terminate execution of a task sequence that is currently being executed, the master device enables the task source device to distribute a command to enable the member devices to terminate execution of the task sequence, the member devices being configured to, after receiving the command, terminate execution of the task sequence.

17. A system as defined in clause 14 in which the series of tasks includes a series of task sequences with each task sequence including a sub-set of the series of tasks, and further in which at least one type of synchrony group management operation, the master device is configured to enable the member devices to cancel execution of a task sequence that has been previously distributed, but for which execution has not begun.

18. A system as defined in clause 17 in which, in the synchrony group management operation enabling the member devices to cancel execution of a task sequence that has been previously distributed but for which execution has not begun, the master device enables the task source device to distribute a command to enable the member devices to cancel execution of the task sequence, the member devices being configured to, after receiving the command,

cancel execution of the task sequence.

19. A system as defined in clause 5 in which, in at least one type of synchrony group management operation, the member device operating as the master device is configured to enable the master device to migrate from one member device to another member device in the synchrony group.

20. A system as defined in clause 5 in which, in at least one type of synchrony group management operation, the master device is configured to enable the task source device to migrate from one device to another device in the system.

21. A system as defined in clause 20 in which

A. the device operating as the task source device is configured to, after being enabled to migrate the task source device to said other device, provide migration information to the other device, the migration information including a source for information respecting the tasks to be distributed, timing information relative to the clock maintained by the task source device and identifications of the member devices,

B. the other device being configured to, after receiving the migration information,

i. distribute the series of tasks to the synchrony group, each task being associated with a time stamp indicating a time, relative to the timing information that it receives from the device operating as the task source device, at which the devices comprising the synchrony group are to execute the respective task, and

ii. notify the members of the synchrony group that it is to thereafter operate as the task source device.

22. A system as defined in clause 21 in which the information respecting the tasks that are to be distributed is a source of streaming information, the other device being configured to, after receiving the migration information, assemble the streaming information into tasks and associate each task with a said time stamp.

23. A system as defined in clause 21 in which the information respecting the tasks that are to be distributed is in a file identified in the migration information, the other device being configured to obtain information from the identified file, assemble the information into tasks and associate each task with a said time stamp.

24. A system as defined in clause 23 in which the information respecting the tasks that are to be distributed begins at an offset, identified in the migration information, into the identified file, the other device being configured to assemble the information from a position in the file associated with the identified offset.

25. A system as defined in clause 23 in which the information respecting the tasks that are to be distributed is in a series of files identified in the migration information, the other device being configured to obtain information from successive files in the series assemble the information into tasks and associate each task with as said time stamp.

26. A system as defined in clause 1 in which the task source device is further configured to distribute the tasks using a selected multi-cast message transmission methodology.

27. A system as defined in clause 1 in which the task source device is configured to provide, associated with at least one task, a time stamp indicating a task execution time later than the time currently indicated by the clock maintained by the task source device.

28. A system as defined in clause 27 in which the task source device is configured to select the delay interval between the time indicated by the time stamp and the current time so to be sufficient to provide that the at least one task distributed by the task source device can be executed by the member devices at the time indicated by the time stamp.

29. A system as defined in clause 28 in which the task source device is configured to select the delay interval between the time indicated by the time stamp and the current time so to be sufficient to provide that the at least one task distributed by the task source device can be distributed to the member devices for execution at the time indicated by the time stamp.

30. A system as defined in clause 27 in which task source device is configured to obtain information associated with the tasks from at least two types of information sources, the task source device being further configured to select, for each task the delay interval between the time indicated by the time stamp and the current time based on the information source type that is associated with the respective task.

31. A system as defined in clause 1 in which at least one member device is further configured to adjust its clock rate in relation to a clock rate value maintained by the task source device's clock.

32. A system as defined in clause 31 in which the at least one member device is configured to adjust its clock rate in relation to time stamps associated with respective ones of the tasks received from the task source device.

33. A system as defined in clause 1 in which at least one other device operates as a task source device configured to distribute tasks to a second synchrony group, the device operating as the task source device for the first synchrony group also operating as a member device of a second synchrony group.

34. A system as defined in clause 1 in which at least one member device comprises:

A. a task receiving module configured to receive the series of tasks,
B. a current time retrieval module configured to obtain, from the task source device, the current time value as indicated by the task source's clock;
C. an execution time determination module configured to determine, from the time stamp associated with each respective task and a time differential value representing a difference between the current time value obtained by the current time retrieval module and a current time value indicated by a clock maintained by the device, a time, relative to the member device's respective clock at which the task is to be executed; and
D. a task execution module configured to execute each respective task at the time determined by the execution time determination module.

35. A system as defined in clause 34 further including a control module for controlling execution of commands received by said interface module.
36. A system as defined in clause 35 in which the at least one member device further comprises a buffer configured to buffer tasks that the task receiving module receives from the task source device until they are to be executed, the task execution module being configured to execute the buffered tasks at the times determined by the execution time determination module.
37. A system as defined in clause 36 in which the series of tasks includes a series of task sequences with each task sequence including a subset of the series of tasks, the interface module being further configured to receive task execution control commands for controlling task execution, the control module being configured to, in response to receipt of at least one task execution control command for controlling task execution, enable the task execution module to terminate execution of a task sequence currently being executed, being configured to not execute subsequent tasks in the task sequence that have been buffered.
38. A system as defined in clause 37 in which the control module is configured to enable the task execution module to resume execution of at least one task associated with a subsequent task sequence at a time determined by the execution time determination module.
39. A system as defined in clause 36 in which the series of tasks includes a series of task sequences with each task sequence including a subset of the series of tasks, the interface module being further configured to receive task execution control commands for controlling task execution, the control module being configured to, in response to receipt of at least one task execution control command to cancel execution of a task sequence for which at least one task has been buffered but for which execution has not begun, enable the task execution module to not execute tasks from that task sequence that have been buffered.
40. A system as defined in clause 39 in which the control module is configured to enable the task execution module to resume execution of at least one task associated with a task sequence subsequent to the task sequence for which at least one task has been buffered but for which execution has not begun.
41. A system as defined in clause 34 in which the member device includes:

A. a migration information receiving module configured to receive migration information from the task source device, the migration information including a source for information respecting the tasks to be distributed, timing information relative to the clock maintained by the task source device and identifications of the member devices of the synchrony group, and
B. a migration control module configure to, after the migration information has been received.,

i. distribute the series of tasks to the synchrony group, each task being associated with a time stamp indicating a time, relative to the timing information that it receives from the device operating as the task source device, at which the devices comprising the synchrony group are to execute the respective task, and
ii. notify the members of the synchrony group that it is to thereafter operate as the task source device.

42. A system as defined in clause 41 in which the information respecting the tasks that are to be distributed is a source of streaming information, the migration control module being configured to, after the migration information has been received, assembling the streaming information into tasks and associate each task with a said time stamp.
43. A system as defined in clause 41 in which the information respecting the tasks that are to be distributed is in a file identified in the migration information, the migration control module being configured to obtain information from the identified file, assemble the information into tasks and associate each task with a said time stamp.
44. A system as defined in clause 43 in which the information respecting the tasks that are to be distributed begins at an offset, identified in the migration information, into the identified file, the migration control module being configured to assemble the information from a position in the file associated with the identified offset.
45. A system as defined in clause 43 in which the information respecting the tasks that are to be distributed is in a series of files identified in the migration information, the migration control module being configured to obtain infor-

mation from successive files in the series assemble the information into tasks and associate each task with as said time stamp.

46. A system as defined in clause 34 in which the member device further includes a clock rate adjustment module configured to adjust the member device's clock rate in relation to a clock rate value maintained by the task source device's clock.

47. A system as defined in clause 46 in which the clock rate adjustment module is configured to adjust the clock rate in relation to time stamps associated with respective ones of the tasks received from the task source device.

48. A system as defined in clause 1 in which the task source device comprises:

A. a task acquisition module configured to obtain respective ones of the tasks;

B. a task execution time determination module configured to determine a time at which each respective task is to be executed, and to associate the respective task with a time stamp indicating its execution time;

C. a task transmission module configured to transmit the series of tasks to said at least one other device; and

D. an execution control command generation module configured to, in response to a predetermined event, enable the task transmission module to insert into the series of tasks transmitted by the task transmission module a command to enable the at least one other device to modify the execution sequence of the tasks transmitted thereto.

49. A system as defined in clause 48 in which the task transmission module is configured to utilize a selected multi-cast transmission methodology.

50. A system as defined in clause 48 in which the predetermined event comprises input indicia provided by an operator.

51. A system as defined in clause 50 in which, in response to said predetermined event, the execution control command generation module is configured to enable the task transmission module to insert into the series of tasks transmitted by the task transmission module a command to enable the at least one other device to control execution of at least one task in relation to the time the predetermined event occurs.

52. A system as defined in clause 51 in which, in response to said predetermined event, the execution control command generation module is configured to enable the task transmission module to insert into the series of tasks transmitted by the task transmission module a command to enable the at least one other device to terminate execution of a task that it is currently executing and/or to not execute at least one task that is to be executed subsequent to the predetermined event.

53. A system as defined in clause 51 in which the series of tasks includes a series of task sequences with each task sequence including a sub-set of the series of tasks, the execution control command generation module being configured to, in response to said predetermined event,

(i) enable the task transmission module to insert into the series of tasks transmitted by the task transmission module, a command enabling the at least one other device to terminate execution of the currently executing task and/or to not execute at least one subsequent task, if any, in the task sequence including the currently executing task; and

(ii) enable

(a) the task execution time determination module to provide that time stamps associated with tasks of task sequences subsequent to the task sequence currently being executed will reflect the termination and/or non-execution of tasks from the task sequence of the task that is currently being executed, and

(b) the task transmission module to transmit the tasks of the subsequent task sequences to the at least one other device.

54. A system as defined in clause 53 in which the task transmission module is configured to insert a command to enable the at least one other device to not execute all tasks in the task sequence subsequent to the terminated and/or non-executed task.

55. A system as defined in clause 48 in which, in response to said predetermined event, the execution control command generation module is configured to enable the task transmission module to insert into the series of tasks transmitted by the task transmission module a command to enable the at least one other device to control execution of a task in relation to the task's position in the series of tasks.

56. A system as defined in clause 55 in which, in response to said predetermined event, the execution control command generation module is configured to enable the task transmission module to insert into the series of tasks transmitted by the task transmission module a command to enable the at least one other device to cancel execution of a task in relation to the task's position in the series of tasks.

57. A system as defined in clause 55 in which, in response to said predetermined event, the execution control command generation module is configured to enable the task transmission module to insert into the series of tasks transmitted by the task transmission module a command to enable the at least one other device to cancel execution of a previously-transmitted task in relation to the task's position in the series of tasks.

58. A system as defined in clause 57 in which, in response to said predetermined event, the execution control command generation module is configured to enable the task transmission module to insert into the series of tasks transmitted by the task transmission module a command to enable the at least one other device to cancel execution of a previously-transmitted task, in relation to the task's position in the series of tasks, for which execution has not begun.

59. A system as defined in clause 55 in which the series of tasks includes a series of task sequences with each task sequence including a sub-set of the series of tasks, the execution control command generation module being configured to, in response to said predetermined event,

(i) enable the task transmission module to insert into the series of tasks transmitted by the task transmission module, a command enabling the at least one other device to cancel execution of a task sequence for which execution has not begun; and
(ii) enable

(a) the task execution time determination module to provide that time stamps associated with tasks of task sequences subsequent to the task sequence whose execution was cancelled will reflect the cancellation, and
(b) the task transmission module to transmit the tasks of the subsequent task sequences to the at least one other device.

60 A system as defined in clause 1 in which the task source device comprises:

A. a task acquisition module configured to obtain respective ones of the tasks;
B. a task execution time determination module configured to determine a time at which each respective task is to be executed, and to associate the respective task with a time stamp indicating its execution time;
C. a task transmission module configured to transmit the series of tasks to said at least one other device; and
D. a task source device migration control module configured to, in response to a predetermined event, provide migration information to another device, the migration information including a source for information respecting the tasks to be distributed, timing information relative to the clock maintained by the task source device and identifications of the member devices of the synchrony group.

61. A system as defined in clause 60 in which the task source device is configured to provide, associated with at least one task, a time stamp indicating a task execution time later than the time currently indicated by the clock maintained by the task source device.

62. A system as defined in clause 61 in which the task source device is configured to select the delay interval between the time indicated by the time stamp and the current time so to be sufficient to provide that the at least one task distributed by the task source device can be executed by the member devices at the time indicated by the time stamp.

63. A system as defined in clause 62 in which the task source device is configured to select the delay interval between the time indicated by the time stamp and the current time so to be sufficient to provide that the at least one task distributed by the task source device can be distributed to the member devices for execution at the time indicated by the time stamp

64. A system as defined in clause 62 in which task source device is configured to obtain information associated with the tasks from at least two types of information sources, the task source device being further configured to select, for each task the delay interval between the time indicated by the time stamp and the current time based on the information source type that is associated with the respective task.

65. A device for executing a series of tasks provided by a task source at times specified by the task source in relation to a clock maintained by the task source, the device comprising

A. an interface module configured to receive the series of tasks, each task being associated with a time stamp, each time stamp indicating a time value relative to a time indicated a clock maintained by the task source, at which the device is to execute the respective task;
B. a current time retrieval module configured to obtain, from the task source, a current time value as indicated by the task source's clock;
C. an execution time determination module configured to determine, from the time stamp associated with each

respective task and a time differential value representing a difference between the current time value obtained by the current time retrieval module and a current time value indicated by a clock maintained by the device, a time, relative to the device's respective clock, at which the task is to be executed; and

D. a task execution module configured to execute each respective task at the time determined by the execution time determination module.

66. A device as defined in clause 65 further including a control module for controlling execution of commands received by said interface module.

67. A device as defined in clause 65 further comprising a buffer configured to buffer tasks that the interface module has received until they are to be executed, the task execution module being configured to execute the buffered tasks at the times determined by the execution time determination module.

68. A device as defined in clause 67 in which the series of tasks includes a series of task sequences with each task sequence including a subset of the series of tasks, the interface module being further configured to receive task execution control commands for controlling task execution, the control module being configured to, in response to receipt of at least one task execution control command for controlling task execution, enable the task execution module to terminate execution of a task sequence currently being executed, being configured to not execute subsequent tasks in the task sequence that have been buffered.

69. A device as defined in clause 68 in which the control module is configured to enable the task execution module to resume execution of at least one task associated with a subsequent task sequence at a time determined by the execution time determination module.

70. A device as defined in clause 69 in which the series of tasks includes a series of task sequences with each task sequence including a subset of the series of tasks, the interface module being further configured to receive task execution control commands for controlling task execution, the control module being configured to, in response to receipt of at least one task execution control command to cancel execution of a task sequence for which at least one task has been buffered but for which execution has not begun, enable the task execution module to not execute tasks from that task sequence that have been buffered.

71. A device as defined in clause 70 in which the control module is configured to enable the task execution module to resume execution of at least one task associated with a task sequence subsequent to the task sequence for which at least one task has been buffered but for which execution has not begun.

72. A device as defined in clause 66, the control module being configured to, in response to receipt of a command to become a member of a synchrony group, enable the interface module to receive tasks for execution by the task execution module.

73. A device as defined in clause 72 in which the control module is configured to, in response to receipt of a command to become a member of a synchrony group, enable the interface module to receive tasks currently being transmitted using a selected multi-cast transmission methodology, and further to retrieve at least one previously distributed task using a selected unicast transmission methodology.

74. A device as defined in clause 65 in which the control module is configured to, in receipt of a command to disengage from a synchrony group, disable the interface module from receiving tasks and the task execution module from executing previously received tasks that have not yet been executed.

75. A device as defined in clause 65 further comprising a user interface module interface module configured to receive control information from a user interface module, the control module being configured to enable selected operations to be performed in response to the control information.

76. A device as defined in clause 75 in which, in response to control information to enable another device to become a member of the device's synchrony group, the control module enables the interface module to transmit a command to the other device to enable the other device to become a member of the synchrony group.

77. A device as defined in clause 75 in which, in response to control information to enable another device that is a member of the device's synchrony group to disengage from the synchrony group, the control module enables the interface module to transmit a command to the other device to enable the other device to disengage from the synchrony group.

78. A device as defined in clause 75 in which, in response to control information to enable the task source to begin operating, the control module performs selected operations to enable the task source to begin operating.

79. A device as defined in clause 78, the device also operating as the task source, the device including a task generator module configured to, under control of the control module, obtain information from which the tasks are to be generated and generate the tasks.

80. A device as defined in clause 79 in which the interface module is further configured to transmit the tasks to at least one other device.

81. A device as defined in clause 79 in which the device is not the task source, the control module being configured to enable the interface module to transmit a command to enable the task source to operate.

82. A device as defined in clause 81 in which tasks are divided into a series of task sequences, and, in response to receipt of control information enabling execution of a sequence of tasks currently being executed to be terminated, the control module is configured to enable the interface module to transmit a command to enable the task source to insert a resynchronize command in the series of tasks associated with the task sequence to enable termination of execution of the task sequence.

83. A device as defined in clause 81 in which tasks are divided into a series of task sequences, and, in response to receipt of control information enabling execution of a sequence of tasks at least a portion of which have been received, but which are not being executed, the control module is configured to enable the interface module to transmit a command to enable the task source to insert a resynchronize command in the series of commands to disable execution of the task sequence.

84. A device as defined in clause 75 in which the control module is configured to enable the user interface module interface module to transmit status information to the user interface module.

85. A device as defined in clause 84 in which the status information includes the execution status of at least one task.

86. A device as defined in clause 65 further including:

A. a migration information receiving module configured to receive migration information from the task source device, the migration information including a source for information respecting the tasks to be distributed, timing information relative to the clock maintained by the task source device and identifications of the member devices of the synchrony group, and

B. a migration control module configured to, after the migration information has been received.,

i. distribute the series of tasks to the synchrony group, each task being associated with a time stamp indicating a time, relative to the timing information that it receives from the device operating as the task source device, at which the devices comprising the synchrony group are to execute the respective task, and

ii. notify the members of the synchrony group that it is to thereafter operate as the task source device.

87. A device as defined in clause 86 in which the information respecting the tasks that are to be distributed is a source of streaming information, the migration control module being configured to, after the migration information has been received, assembling the streaming information into tasks and associate each task with a said time stamp.

88. A device as defined in clause 86 in which the information respecting the tasks that are to be distributed is in a file identified in the migration information, the migration control module being configured to obtain information from the identified file, assemble the information into tasks and associate each task with a said time stamp.

89. A device as defined in clause 88 in which the information respecting the tasks that are to be distributed begins at an offset, identified in the migration information, into the identified file, the migration control module being configured to assemble the information from a position in the file associated with the identified offset.

90. A device as defined in clause 89 in which the information respecting the tasks that are to be distributed is in a series of files identified in the migration information, the migration control module being configured to obtain information from successive files in the series assemble the information into tasks and associate each task with as said time stamp.

91. A device as defined in clause 65 further including a clock rate adjustment module configured to adjust the member device's clock rate in relation to a clock rate value maintained by the task source device's clock.

92. A task source device for distributing a series of tasks for execution by at least one other device at respective execution times, the task source device comprising:

A. a task acquisition module configured to obtain respective ones of the tasks;

B. a task execution time determination module configured to determine a time at which each respective task is to be executed, and to associate the respective task with a time stamp indicating its execution time;

C. a task transmission module configured to transmit the series of tasks to said at least one other device; and

D. an execution control command generation module configured to, in response to a predetermined event, enable the task transmission module to insert into the series of tasks transmitted by the task transmission module a command to enable the at least one other device to modify the execution sequence of the tasks transmitted thereto.

93. A task source device as defined in clause 92 in which the task transmission module is configured to utilize a selected multi-cast transmission methodology.

94. A task source device as defined in clause 92 in which the predetermined event comprises input indicia provided by an operator.

95. A task source device as defined in clause 94 in which, in response to said predetermined event, the execution

control command generation module is configured to enable the task transmission module to insert into the series of tasks transmitted by the task transmission module a command to enable the at least one other device to control execution of at least one task in relation to the time the predetermined event occurs.

96. A task source device as defined in clause 95 in which, in response to said predetermined event, the execution control command generation module is configured to enable the task transmission module to insert into the series of tasks transmitted by the task transmission module a command to enable the at least one other device to terminate execution of a task that it is currently executing and/or to not execute at least one task that is to be executed subsequent to the predetermined event.

97. A task source device as defined in clause 95 in which the series of tasks includes a series of task sequences with each task sequence including a sub-set of the series of tasks, the execution control command generation module being configured to, in response to said predetermined event,

(i) enable the task transmission module to insert into the series of tasks transmitted by the task transmission module, a command enabling the at least one other device to terminate execution of the currently executing task and/or to not execute at least one subsequent task, if any, in the task sequence including the currently executing task; and
(ii) enable

(a) the task execution time determination module to provide that time stamps associated with tasks of task sequences subsequent to the task sequence currently being executed will reflect the termination and/or non-execution of tasks from the task sequence of the task that is currently being executed, and
(b) the task transmission module to transmit the tasks of the subsequent task sequences to the at least one other device.

98. A task source device as defined in clause 97 in which the task transmission module is configured to insert a command to enable the at least one other device to not execute all tasks in the task sequence subsequent to the terminated and/or non-executed task.

99. A task source device as defined in clause 92 in which, in response to said predetermined event, the execution control command generation module is configured to enable the task transmission module to insert into the series of tasks transmitted by the task transmission module a command to enable the at least one other device to control execution of a task in relation to the task's position in the series of tasks.

100. A task source device as defined in clause 99 in which, in response to said predetermined event, the execution control command generation module is configured to enable the task transmission module to insert into the series of tasks transmitted by the task transmission module a command to enable the at least one other device to cancel execution of a task in relation to the task's position in the series of tasks.

101. A task source device as defined in clause 99 in which, in response to said predetermined event, the execution control command generation module is configured to enable the task transmission module to insert into the series of tasks transmitted by the task transmission module a command to enable the at least one other device to cancel execution of a previously-transmitted task in relation to the task's position in the series of tasks.

102. A task source device as defined in clause 101 in which, in response to said predetermined event, the execution control command generation module is configured to enable the task transmission module to insert into the series of tasks transmitted by the task transmission module a command to enable the at least one other device to cancel execution of a previously-transmitted task, in relation to the task's position in the series of tasks, for which execution has not begun.

103. A task source device as defined in clause 99 in which the series of tasks includes a series of task sequences with each task sequence including a sub-set of the series of tasks, the execution control command generation module being configured to, in response to said predetermined event,

(i) enable the task transmission module to insert into the series of tasks transmitted by the task transmission module, a command enabling the at least one other device to cancel execution of a task sequence for which execution has not begun; and
(ii) enable

(a) the task execution time determination module to provide that time stamps associated with tasks of task sequences subsequent to the task sequence whose execution was cancelled will reflect the cancellation, and
(b) the task transmission module to transmit the tasks of the subsequent task sequences to the at least one other device.

104. A task source device for distributing a series of tasks for execution by at least one other device at respective execution times, the task source device comprising:

A. a task acquisition module configured to obtain respective ones of the tasks;
B. a task execution time determination module configured to determine a time at which each respective task is to be executed, and to associate the respective task with a time stamp indicating its execution time, the task execution time determination module being configured to provide, associated with at least one task, a time stamp indicating a task execution time later than the time currently indicated by a clock maintained by the task source device; and
C. a task transmission module configured to transmit the series of tasks to said at least one other device.

105. A system as defined in clause 104 in which the task source device is configured to select the delay interval between the time indicated by the time stamp and the current time so to be sufficient to provide that the at least one task distributed by the task source device can be executed by the member devices at the time indicated by the time stamp.
106. A system as defined in clause 105 in which the task source device is configured to select the delay interval between the time indicated by the time stamp and the current time so to be sufficient to provide that the at least one task distributed by the task source device can be distributed to the member devices for execution at the time indicated by the time stamp
107. A system as defined in clause 104 in which task source device is configured to obtain information associated with the tasks from at least two types of information sources, the task source device being further configured to select, for each task the delay interval between the time indicated by the time stamp and the current time based on the information source type that is associated with the respective task.
108. A task source device for distributing a series of tasks for execution by at least one other device, the task source device comprising:

A. a task acquisition module configured to obtain respective ones of the tasks;
B. a task execution time determination module configured to determine a time at which each respective task is to be executed, and to associate the respective task with a time stamp indicating its execution time;
C. a task transmission module configured to transmit the series of tasks to said at least one other device; and
D. a task source device migration control module configured to, in response to a predetermined event, provide migration information to another device, the migration information including a source for information respecting the tasks to be distributed, timing information relative to the clock maintained by the task source device and identifications of the member devices of the synchrony group.

109. A method of operating a system comprising plurality of devices, one of the devices operating as a task source device and at least one other device operating as a member of a synchrony group,

A. the task source device being enabled to distribute a series of tasks to the synchrony group, each task being associated with a time stamp indicating a time, relative to a clock maintained by the task source device, at which the devices comprising the synchrony group are to execute the respective task;
B each member device being enabled to:

(i) periodically obtain from the task source device an indication of a current time value indicated by the task source device's clock, and
(ii) determine, from the time stamp associated with each respective task and a time differential value representing a difference between the current time value indicated by the task source device's clock, and a current time value indicated by its respective clock, a time, relative to its respective clock, at which it is to execute the task.

110. A method as defined in clause 109 in which the synchrony group comprises a plurality of member devices.
111. A method as defined in clause 110 in which each device comprising a member of the synchrony group is further enabled to execute each task that it receives from the task source device at the determined time, thereby to facilitate execution by them of respective tasks in the series in respective timing relationships relative to the time indicated by the task source device's clock.
112. A method as defined in clause 111 in which the member devices are enabled to execute respective tasks in synchrony.
113. A method as defined in clause 110 in which one of the member devices operates as a master device for the

synchrony group, any other member devices comprising respective slave devices, the master device being enabled to perform at least one type of synchrony group management operation in connection with the member devices comprising the synchrony group.

114. A method as defined in clause 113 further including a user interface module enabled to control the master device's performance of said at least one type of synchrony group management operation, the master device being further enabled to provide status information relating to the status of the synchrony group to the user interface module.

115. A method as defined in clause 114 in which the status information includes identifications of the devices comprising the synchrony group.

116. A method as defined in clause 114 in which the status information includes an identification of the task currently being executed.

117. A method as defined in clause 113, the method comprising at least one additional device, in which, in one type of synchrony group management operation, the master device is enabled to enable the at least one additional device to join the synchrony group as a slave device.

118. A method as defined in clause 117 in which the task source device is enabled to distribute tasks to the member devices using a selected multi-cast transmission methodology, the member devices being enabled to buffer the tasks until they are to be executed, and further in which, when the at least one additional device joins the synchrony group as a slave device, the task source device is enabled to transmit at least one previously distributed task to the slave device using a selected unicast transmission methodology.

119. A method as defined in clause 113 in which, in at least one type of synchrony group management operation, the master device is enabled to enable the task source device to join the synchrony group as a slave device, the task source device continuing to operate as the task source device for the synchrony group.

120. A method as defined in clause 113 in which, in at least one type of synchrony group management operation, the master device is enabled to enable a slave device to disengage from the synchrony group, the disengaged slave device thereafter not being a member device in the synchrony group.

121. A method as defined in clause 113 in which, in at least one type of synchrony group management operation, the master device is enabled to control the series of tasks to be distributed by the task source device.

122. A method as defined in clause 113 in which, in at least one type of synchrony group management operation, the master device is further enabled to control execution by the member devices of the tasks that have been distributed by the task source device.

123. A method as defined in clause 122 in which the series of tasks includes a series of task sequences with each task sequence including a sub-set of the series of tasks, and further in which in at least one type of synchrony group management operation, the master device is enabled to enable the member devices to terminate execution of a task sequence that is currently being executed.

124. A method as defined in clause 123 in which, in the synchrony group management operation enabling the member devices to terminate execution of a task sequence that is currently being executed, the master device enables the task source device to distribute a command to enable the member devices to terminate execution of the task sequence, the member devices being enabled to, after receiving the command, terminating execution of the task sequence.

125. A method as defined in clause 122 in which the series of tasks includes a series of task sequences with each task sequence including a sub-set of the series of tasks, and further in which at least one type of synchrony group management operation, the master device is enabled to enable the member devices to cancel execution of a task sequence that has been previously distributed, but for which execution has not begun.

126. A method as defined in clause 125 in which, in the synchrony group management operation enabling the member devices to cancel execution of a task sequence that has been previously distributed but for which execution has not begun, the master device enables the task source device to distribute a command to enable the member devices to cancel execution of the task sequence, the member devices being enabled to, after receiving the command, cancel execution of the task sequence.

127. A method as defined in clause 113 in which, in at least one type of synchrony group management operation, the member device operating as the master device is enabled to enable the master device to migrate from one member device to another member device in the synchrony group.

128. A method as defined in clause 113 in which, in at least one type of synchrony group management operation, the master device is enabled to perform the step of enabling the task source device to migrate from one device to another device in the system.

129. A method as defined in clause 128 in which

A. the device operating as the task source device is enable to perform the step of, after being enabled to migrate the task source device to said other device, providing migration information to the other device, the migration

information including a source for information respecting the tasks to be distributed, timing information relative to the clock maintained by the task source device and identifications of the member devices,
B. the other device is enabled to, after receiving the migration information, perform the steps of

i. distributing the series of tasks to the synchrony group, each task being associated with a time stamp indicating a time, relative to the timing information that it receives from the device operating as the task source device, at which the devices comprising the synchrony group are to execute the respective task, and
ii. notifying the members of the synchrony group that it is to thereafter operate as the task source device.

130. A method as defined in clause 129 in which the information respecting the tasks that are to be distributed is a source of streaming information, the other device being enabled to, after receiving the migration information, perform the steps of assembling the streaming information into tasks and associating each task with a said time stamp.

131. A method as defined in clause 129 in which the information respecting the tasks that are to be distributed is in a file identified in the migration information, the other device being enabled to perform the steps of obtaining information from the identified file, assembling the information into tasks and associating each task with a said time stamp.

132. A method as defined in clause 131 in which the information respecting the tasks that are to be distributed begins at an offset, identified in the migration information, into the identified file, the other device being enabled to perform the step of assembling the information from a position in the file associated with the identified offset.

133. A method as defined in clause 131 in which the information respecting the tasks that are to be distributed is in a series of files identified in the migration information, the other device being enabled to perform the step of obtaining information from successive files in the series assemble the information into tasks and associate each task with as said time stamp.

134. A method as defined in clause 109 in which the task source device is further enabled to distribute the tasks using a selected multi-cast message transmission methodology.

135. A method as defined in clause 109 in which the task source device is enabled to perform the step of providing, provide, associated with at least one task, a time stamp indicating a task execution time later than the time currently indicated by the clock maintained by the task source device.

136. A method as defined in clause 135 in which the task source device is enabled to perform the step of selecting the delay interval between the time indicated by the time stamp and the current time so to be sufficient to provide that the at least one task distributed by the task source device can be executed by the member devices at the time indicated by the time stamp.

137. A method as defined in clause 136 in which the task source device is enabled to perform the step of selecting the delay interval between the time indicated by the time stamp and the current time so to be sufficient to provide that the at least one task distributed by the task source device can be distributed to the member devices for execution at the time indicated by the time stamp

138. A method as defined in clause 135 in which task source device is enabled to perform the steps of obtaining information associated with the tasks from at least two types of information sources, and selecting, for each task, the delay interval between the time indicated by the time stamp and the current time based on the information source type that is associated with the respective task.

139. A method as defined in clause 109 in which at least one member device is further enabled to perform the step of adjusting its clock rate in relation to a clock rate value maintained by the task source device's clock.

140. A method as defined in clause 139 in which the at least one member device is enabled to perform the step of adjusting its clock rate in relation to time stamps associated with respective ones of the tasks received from the task source device.

141. A method as defined in clause 109 in which at least one other device operates as a task source device enabled to distribute tasks to a second synchrony group, the device operating as the task source device for the first synchrony group also operating as a member device of a second synchrony group.

142. A method as defined in clause 109 including, within a member device,

A. a task receiving step of receiving the series of tasks,
B. a current time retrieval step of obtaining, from the task source device, the current time value as indicated by the task source's clock;
C. an execution time determination step of determining, from the time stamp associated with each respective task and a time differential value representing a difference between the current time value obtained during the current time retrieval step and a current time value indicated by a clock maintained by the device, a time, relative to the member device's respective clock at which the task is to be executed; and
D. a task execution step of executing each respective task at the time determined during the execution time determination step.

143. A method as defined in clause 142 further including a control step for controlling execution of commands received during the task receiving step

144. A method as defined in clause 143 in which the at least one member device further comprises a buffer configured to buffer tasks received from the task source device during the task receiving step until they are to be executed, the task execution step including the step of executing the buffered tasks at the times determined during the execution time determination step.

145. A method as defined in clause 144 in which the series of tasks includes a series of task sequences with each task sequence including a subset of the series of tasks, the task receiving step being further enabled to receive task execution control commands for controlling task execution, the control step including the step of, in response to receipt of at least one task execution control command for controlling task execution, controlling the task execution step to terminate execution of a task sequence currently being executed, and further to not execute subsequent tasks in the task sequence that have been buffered.

146. A method as defined in clause 145 in which the control step includes the step of enabling the task execution step to resume execution of at least one task associated with a subsequent task sequence at a time determined during the execution time determination step.

147. A method as defined in clause 144 in which the series of tasks includes a series of task sequences with each task sequence including a subset of the series of tasks, the task receiving step including the step of receiving task execution control commands for controlling task execution, the control step including the step of, in response to receipt of at least one task execution control command to cancel execution of a task sequence for which at least one task has been buffered but for which execution has not begun, providing that tasks from that task sequence that have been buffered not be executed.

148. A method as defined in clause 147 in which the control step includes the step of enabling execution to resume of at least one task associated with a task sequence subsequent to the task sequence for which at least one task has been buffered but for which execution has not begun.

149. A method as defined in clause 142 in which the member device performs:

A. migration information receiving step of receiving migration information from the task source device, the migration information including a source for information respecting the tasks to be distributed, timing information relative to the clock maintained by the task source device and identifications of the member devices of the synchrony group, and
B. a migration control step of, after the migration information has been received.,

i. distributing the series of tasks to the synchrony group, each task being associated with a time stamp indicating a time, relative to the timing information that it receives from the device operating as the task source device, at which the devices comprising the synchrony group are to execute the respective task, and
ii. notifying the members of the synchrony group that it is to thereafter operate as the task source device.

150. A method as defined in clause 149 in which the information respecting the tasks that are to be distributed is a source of streaming information, the migration control step includes the steps of, after the migration information has been received, assembling the streaming information into tasks and associating each task with a said time stamp.

151. A method as defined in clause 149 in which the information respecting the tasks that are to be distributed is in a file identified in the migration information, the migration control step including the steps of obtaining information from the identified file, assembling the information into tasks and associating each task with a said time stamp.

152. A method as defined in clause 151 in which the information respecting the tasks that are to be distributed begins at an offset, identified in the migration information, into the identified file, the migration control step including the step of assembling the information from a position in the file associated with the identified offset.

153. A method as defined in clause 151 in which the information respecting the tasks that are to be distributed is in a series of files identified in the migration information, the migration control step including the steps of obtaining information from successive files in the series assemble the information into tasks and associating each task with as said time stamp.

154. A method as defined in clause 142 in which the member device is further enabled to perform a clock rate adjustment step including the step of adjusting the member device's clock rate in relation to a clock rate value maintained by the task source device's clock.

155. A method as defined in clause 154 in which the clock rate adjustment step includes the step of determining adjust the clock rate in relation to time stamps associated with respective ones of the tasks received from the task source device.

156. A method as defined in clause 109 including, within a task source device,

A. a task acquisition step of obtaining respective ones of the tasks;
B. a task execution time determination step of determining a time at which each respective task is to be executed, and to associate the respective task with a time stamp indicating its execution time;
C. a task transmission step of transmitting the series of tasks to said at least one other device; and
D. an execution control command generation step of, in response to a predetermined event and during the task transmission step, the insertion into the series of tasks transmitted by the task transmission module of a command to enable the at least one other device to modify the execution sequence of the tasks transmitted thereto.

157. A method as defined in clause 156 in which the task transmission step includes the step of utilizing a selected multi-cast transmission methodology.

158. A method as defined in clause 156 in which the predetermined event includes the step of receiving input indicia provided by an operator.

159. A method as defined in clause 158 in which the execution control command generation step includes the step of enabling, in response to said predetermined event and during the task transmission step, the insertion into the series of tasks of a command to enable the at least one other device to control execution of at least one task in relation to the time the predetermined event occurs.

160. A method as defined in clause 159 in which, the execution control command generation step includes the step of enabling, in response to said predetermined event and during the task transmission step, the insertion into the series of tasks of a command to enable the at least one other device to terminate execution of a task that it is currently executing and/or to not execute at least one task that is to be executed subsequent to the predetermined event.

161. A method as defined in clause 159 in which the series of tasks includes a series of task sequences with each task sequence including a sub-set of the series of tasks, the execution control command generation step including the steps of, in response to said predetermined event,

(i) enabling during the task transmission step the insertion, into the series of tasks, of a command enabling the at least one other device to terminate execution of the currently executing task and/or to not execute at least one subsequent task, if any, in the task sequence including the currently executing task; and
(ii) enabling

(a) during the task execution time determination step, that time stamps associated with tasks of task se-

quences subsequent to the task sequence currently being executed will reflect the termination and/or non-execution of tasks from the task sequence of the task that is currently being executed, and
(b) during the task transmission step, the transmission of the tasks of the subsequent task sequences to the at least one other device.

162. A method as defined in clause 161 in which the task transmission step includes the step of inserting a command into the task sequence to enable the at least one other device to not execute all tasks in the task sequence subsequent to the terminated and/or non-executed task.

163. A method as defined in clause 159 in which the execution control command generation step include the step of enabling, in response to said predetermined event and during the task transmission step, the insertion into the series of tasks of a command to enable the at least one other device to control execution of a task in relation to the task's position in the series of tasks.

164. A method as defined in clause 163 in which the execution control command generation step includes the step of, in response to said predetermined event and during the task transmission step, the insertion into the series of tasks of a command to enable the at least one other device to cancel execution of a task in relation to the task's position in the series of tasks.

165. A method as defined in clause 163 in which the execution control command generation step includes the step of enabling, in response to said predetermined event and during the task transmission step, the inserting into the series of tasks of a command to enable the at least one other device to cancel execution of a previously-transmitted task in relation to the task's position in the series of tasks.

166. A method as defined in clause 165 in which, the execution control command generation step includes the step of, in response to said predetermined event and during the task transmission step, the insertion into the series of tasks of a command to enable the at least one other device to cancel execution of a previously-transmitted task, in relation to the task's position in the series of tasks, for which execution has not begun.

167. A method as defined in clause 163 in which the series of tasks includes a series of task sequences with each task sequence including a sub-set of the series of tasks, the execution control command generation step including the steps of, in response to said predetermined event,

(i) enabling, during the task transmission step, the insertion, into the series of tasks, of a command enabling the at least one other device to cancel execution of a task sequence for which execution has not begun; and
(ii) enabling

(a) during the task execution time determination step, that time stamps associated with tasks of task sequences subsequent to the task sequence whose execution was cancelled will reflect the cancellation, and
(b) during the task transmission step, the transmission of the tasks of the subsequent task sequences to the at least one other device.

168. A method as defined in clause 109 in which the task source device is enabled to perform

A. a task acquisition step of obtaining respective ones of the tasks;
B. a task execution time determination step of determining a time at which each respective task is to be executed, and to associate the respective task with a time stamp indicating its execution time;
C. a task transmission step of transmitting the series of tasks to said at least one other device; and
D. a task source device migration control step of, in response to a predetermined event, providing migration information to another device, the migration information including a source for information respecting the tasks to be distributed, timing information relative to the clock maintained by the task source device and identifications of the member devices of the synchrony group.

169. A method as defined in clause 109 in which the task source device is enabled to perform the step of providing, associated with at least one task, a time stamp indicating a task execution time later than the time currently indicated by the clock maintained by the task source device.

170. A method as defined in clause 169 in which the task source device is enabled to perform the step of selecting

the delay interval between the time indicated by the time stamp and the current time so to be sufficient to provide that the at least one task distributed by the task source device can be executed by the member devices at the time indicated by the time stamp.

171. A method as defined in clause 170 in which the task source device is enabled to perform the step of selecting the delay interval between the time indicated by the time stamp and the current time so to be sufficient to provide that the at least one task distributed by the task source device can be distributed to the member devices for execution at the time indicated by the time stamp

172. A method as defined in clause 169 in which task source device is enabled to perform the step of obtaining information associated with the tasks from at least two types of information sources, and selecting for each task the delay interval between the time indicated by the time stamp and the current time based on the information source type that is associated with the respective task.

173. A method of operating a device for executing a series of tasks provided by a task source at times specified by the task source in relation to a clock maintained by the task source, the method including

A. a task receiving step of receiving the series of tasks, each task being associated with a time stamp, each time stamp indicating a time value relative to a time indicated a clock maintained by the task source, at which the device is to execute the respective task;
B. a current time retrieval module of obtaining, from the task source, a current time value as indicated by the task source's clock;
C. an execution time determination step of determining, from the time stamp associated with each respective task and a time differential value representing a difference between the current time value obtained during the current time retrieval step and a current time value indicated by a clock maintained by the device, a time, relative to the device's respective clock, at which the task is to be executed; and
D. a task execution module step of executing each respective task at the time determined during the execution time determination step.

174. A method as defined in clause 173 further including a control step for controlling execution of commands received by said interface module.

175. A method as defined in clause 174 further comprising a buffer configured to buffer tasks that have been received until they are to be executed, the task execution step including the step of executing the buffered tasks at the times determined during the execution time determination step.

176. A method as defined in clause 175 in which the series of tasks includes a series of task sequences with each task sequence including a subset of the series of tasks, the interface module being further enabled to receive task execution control commands for controlling task execution, the control module being enabled to, in response to receipt of at least one task execution control command for controlling task execution, enable the task execution module to terminate execution of a task sequence currently being executed, being enabled to not execute subsequent tasks in the task sequence that have been buffered.

177. A method as defined in clause 176 in which the control step includes the step of enabling task execution to resume execution with at least one task associated with a subsequent task sequence at a time determined during the execution time determination step.

178. A method as defined in clause 175 in which the series of tasks includes a series of task sequences with each task sequence including a subset of the series of tasks, the task receiving step including the step of receiving task execution control commands for controlling task execution, the control step, in response to receipt of at least one task execution control command to cancel execution of a task sequence for which at least one task has been buffered but for which execution has not begun, including the step of providing that task execution not including execution of tasks from that task sequence that have been buffered.

179. A method as defined in clause 178 in which the control step includes the step of enabling task execution to resume execution of at least one task associated with a task sequence subsequent to the task sequence for which at least one task has been buffered but for which execution has not begun.

180. A method as defined in clause 173, the control step including the step of, in response to receipt of a command to become a member of a synchrony group, receiving tasks during the task receiving step for execution during the task execution step.

181. A method as defined in clause 180 in which the control step includes the step of, in response to receipt of a command to become a member of a synchrony group, enable the task receiving step to include the step of receiving tasks currently being transmitted using a selected multi-cast transmission methodology, and further to include the step of retrieving at least one previously distributed task using a selected unicast transmission methodology.

182. A method as defined in clause 173 in which the control step includes the steps of, in receipt of a command to disengage from a synchrony group, disabling the receipt of tasks and the execution of previously-received tasks that have not yet been executed.

183. A method as defined in clause 173 further comprising a user interface module control information receiving step of receiving control information from a user interface module, the control step including the step of enabling selected operations to be performed in response to the control information.

184 A method as defined in clause 183 in which, in response to control information to enable another device to become a member of the device's synchrony group, the control step includes the step of transmitting a command to the other device to enable the other device to become a member of the synchrony group.

185. A method as defined in clause 183 in which, in response to control information to enable another device that is a member of the device's synchrony group to disengage from the synchrony group, the control module enables the interface module to transmit a command to the other device to enable the other device to disengage from the synchrony group.

186. A method as defined in clause 185 in which, in response to control information to enable the task source to begin operating, the control step includes the step of performing selected operations to enable the task source to begin operating.

187. A method as defined in clause 186, the device also operating as the task source, the method including a task generation steps of, under control of the control step, obtaining information from which the tasks are to be generated and generating the tasks.

188. A method as defined in clause 187 further including the step of transmitting the tasks to at least one other device.

189. A method as defined in clause 187 in which the device is not the task source, the control step including the step of enabling the transmission of a command to enable the task source to operate.

190. A method as defined in clause 189 in which tasks are divided into a series of task sequences, and, in response to receipt of control information enabling execution of a sequence of tasks currently being executed to be terminated, the control step includes the step of transmitting a command to enable the task source to insert a resynchronize command in the series of tasks associated with the task sequence to enable termination of execution of the task sequence.

191. A method as defined in clause 189 in which tasks are divided into a series of task sequences, and, in response to receipt of control information enabling execution of a sequence of tasks at least a portion of which have been received, but which are not being executed, the control step includes the step of transmitting a command to enable the task source to insert a resynchronize command in the series of commands to disable execution of the task sequence.

192. A method as defined in clause 174 in which the control step includes the step of transmitting status information to the user interface module.

193. A method as defined in clause 192 in which the status information includes the execution status of at least one task.

194. A method as defined in clause 173 in which the member device performs:

A. migration information receiving step of receiving migration information from the task source device, the migration information including a source for information respecting the tasks to be distributed, timing information relative to the clock maintained by the task source device and identifications of the member devices of the synchrony group, and
B. a migration control step of, after the migration information has been received.,

i. distributing the series of tasks to the synchrony group, each task being associated with a time stamp indicating a time, relative to the timing information that it receives from the device operating as the task source device, at which the devices comprising the synchrony group are to execute the respective task, and
ii. notifying the members of the synchrony group that it is to thereafter operate as the task source device.

195. A method as defined in clause 194 in which the information respecting the tasks that are to be distributed is a source of streaming information, the migration control step includes the steps of, after the migration information has been received, assembling the streaming information into tasks and associating each task with a said time stamp.

196. A method as defined in clause 194 in which the information respecting the tasks that are to be distributed is in a file identified in the migration information, the migration control step including the steps of obtaining information from the identified file, assembling the information into tasks and associating each task with a said time stamp.

197. A method as defined in clause 196 in which the information respecting the tasks that are to be distributed begins at an offset, identified in the migration information, into the identified file, the migration control step including the step of assembling the information from a position in the file associated with the identified offset.

198. A method as defined in clause 196 in which the information respecting the tasks that are to be distributed is in a series of files identified in the migration information, the migration control step including the steps of obtaining information from successive files in the series assemble the information into tasks and associating each task with as said time stamp.

199. A method as defined in clause 173 in which the member device is further enabled to perform a clock rate adjustment step including the step of adjusting the member device's clock rate in relation to a clock rate value maintained by the task source device's clock.

200. A method as defined in clause 199 in which the clock rate adjustment step includes the step of determining adjust the clock rate in relation to time stamps associated with respective ones of the tasks received from the task source device.

201. A method of operating a device for distributing a series of tasks for execution by at least one other device at respective execution times, the method comprising:

A. a task acquisition step of obtaining respective ones of the tasks;
B. a task execution time determination step of determining a time at which each respective task is to be executed, and to associate the respective task with a time stamp indicating its execution time;
C. a task transmission step of transmitting the series of tasks to said at least one other device; and
D. an execution control command generation step of, in response to a predetermined event and during the task transmission step, the insertion into the series of tasks transmitted by the task transmission module of a command to enable the at least one other device to modify the execution sequence of the tasks transmitted thereto.

202. A method as defined in clause 201 in which the task transmission step includes the step of utilizing a selected multi-cast transmission methodology.

203. A method as defined in clause 201 in which the predetermined event includes the step of receiving input indicia provided by an operator.

204. A method as defined in clause 203 in which the execution control command generation step includes the step of enabling, in response to said predetermined event and during the task transmission step, the insertion into the series of tasks of a command to enable the at least one other device to control execution of at least one task in relation to the time the predetermined event occurs.

205. A method as defined in clause 204 in which, the execution control command generation step includes the step of enabling, in response to said predetermined event and during the task transmission step, the insertion into the series of tasks of a command to enable the at least one other device to terminate execution of a task that it is currently executing and/or to not execute at least one task that is to be executed subsequent to the predetermined event.

206. A method as defined in clause 203 in which the series of tasks includes a series of task sequences with each task sequence including a sub-set of the series of tasks, the execution control command generation step including the steps of, in response to said predetermined event,

(i) enabling during the task transmission step the insertion, into the series of tasks, of a command enabling the at least one other device to terminate execution of the currently executing task and/or to not execute at least one subsequent task, if any, in the task sequence including the currently executing task; and
(ii) enabling

(a) during the task execution time determination step, that time stamps associated with tasks of task sequences subsequent to the task sequence currently being executed will reflect the termination and/or non-execution of tasks from the task sequence of the task that is currently being executed, and
(b) during the task transmission step, the transmission of the tasks of the subsequent task sequences to the at least one other device.

207. A method as defined in clause 206 in which the task transmission step includes the step of inserting a command into the task sequence to enable the at least one other device to not execute all tasks in the task sequence subsequent to the terminated and/or non-executed task.

208. A method as defined in clause 201 in which the execution control command generation step include the step of enabling, in response to said predetermined event and during the task transmission step, the insertion into the series of tasks of a command to enable the at least one other device to control execution of a task in relation to the task's position in the series of tasks.

209. A method as defined in clause 208 in which the execution control command generation step includes the step of, in response to said predetermined event and during the task transmission step, the insertion into the series of tasks of a command to enable the at least one other device to cancel execution of a task in relation to the task's position in the series of tasks.

210. A method as defined in clause 208 in which the execution control command generation step includes the step of enabling, in response to said predetermined event and during the task transmission step, the inserting into the series of tasks of a command to enable the at least one other device to cancel execution of a previously-transmitted task in relation to the task's position in the series of tasks.

211. A method as defined in clause 210 in which, the execution control command generation step includes the step of, in response to said predetermined event and during the task transmission step, the insertion into the series of tasks of a command to enable the at least one other device to cancel execution of a previously-transmitted task, in relation to the task's position in the series of tasks, for which execution has not begun.

212. A method as defined in clause 208 in which the series of tasks includes a series of task sequences with each task sequence including a sub-set of the series of tasks, the execution control command generation step including the steps of, in response to said predetermined event,

(i) enabling, during the task transmission step, the insertion, into the series of tasks, of a command enabling the at least one other device to cancel execution of a task sequence for which execution has not begun; and
(ii) enabling

(a) during the task execution time determination step, that time stamps associated with tasks of task sequences subsequent to the task sequence whose execution was cancelled will reflect the cancellation, and
(b) during the task transmission step, the transmission of the tasks of the subsequent task sequences to the at least one other device.

213. A method of operating a device for distributing a series of tasks for execution by at least one other device at respective execution times, the method comprising:

A. a task acquisition step of obtaining respective ones of the tasks;
B. a task execution time determination step of determining a time at which each respective task is to be executed, and to associating the respective task with a time stamp indicating its execution time, the task execution time determination step including the step of providing, associated with at least one task, a time stamp indicating a task execution time later than the time currently indicated by a clock maintained by the task source device; and
C. a task transmission step of transmitting the series of tasks to said at least one other device.

214. A method as defined in clause 213 in which the task execution time determination step includes the step of selecting the delay interval between the time indicated by the time stamp and the current time so to be sufficient to provide that the at least one task distributed by the device can be executed by at least one other device at the time indicated by the time stamp.

215. A method as defined in clause 214 in which the task execution time determination step includes the step of selecting the delay interval between the time indicated by the time stamp and the current time so to be sufficient to provide that the at least one task distributed by the device can be distributed to other devices over a network for execution by the other devices at the time indicated by the time stamp.

216. A method as defined in clause 213 in which task acquisition step includes the step of obtaining information associated with the tasks from at least two types of information sources, the task execution time determination step including the step of selecting, for each task the delay interval between the time indicated by the time stamp and the current time based on the information source type that is associated with the respective task.

217. A method of operating a device for distributing a series of tasks for execution by at least one other device, the method comprising:

A. a task acquisition module configured to obtain respective ones of the tasks;
B. a task execution time determination module configured to determine a time at which each respective task is to be executed, and to associate the respective task with a time stamp indicating its execution time;
C. a task transmission module configured to transmit the series of tasks to said at least one other device; and
D. a task source device migration control module configured to, in response to a predetermined event, provide migration information to another device, the migration information including a source for information respecting the tasks to be distributed, timing information relative to the clock maintained by the task source device and identifications of the member devices of the synchrony group.

218. A computer program product for use in connection with a computer to provide a device for executing a series of tasks provided by a task source at times specified by the task source in relation to a clock maintained by the task source, the computer program product comprising a computer-readable medium having encoded thereon:

A. an interface module configured to enable the computer to receive the series of tasks, each task being associated with a time stamp, each time stamp indicating a time value relative to a time indicated a clock maintained by the task source, at which the device is to execute the respective task;
B. a current time retrieval module configured to enable the computer to obtain, from the task source, a current time value as indicated by the task source's clock;
C. an execution time determination module configured to enable the computer to determine, from the time stamp associated with each respective task and a time differential value representing a difference between the current time value obtained by the current time retrieval module and a current time value indicated by a clock maintained by the device, a time, relative to the device's respective clock, at which the task is to be executed; and
D. a task execution module configured to enable the computer to execute each respective task at the time determined by the execution time determination module.

219. A computer program product as defined in clause 218 further including a control module for enabling said computer to control execution of commands received by the interface module.

220. A computer program product as defined in clause 219 further comprising a buffer module configured to enable the computer to buffer tasks received by the interface module until they are to be executed, the task execution

module being configured to enable the computer to execute the buffered tasks at the times determined by the execution time determination module.

221. A computer program product as defined in clause 220 in which the series of tasks includes a series of task sequences with each task sequence including a subset of the series of tasks, the interface module being further configured to enable the computer to receive task execution control commands for controlling task execution, the control module being configured to enable the computer to, in response to receipt of at least one task execution control command for controlling task execution, enable the task execution module to terminate execution of a task sequence currently being executed, being configured to enable the computer to not execute subsequent tasks in the task sequence that have been buffered.

222. A computer program product as defined in clause 220 in which the control module is configured to enable the computer to enable the task execution module to resume execution of at least one task associated with a subsequent task sequence at a time determined by the execution time determination module.

223. A computer program product as defined in clause 219 in which the series of tasks includes a series of task sequences with each task sequence including a subset of the series of tasks, the interface module being further configured to enable the computer to receive task execution control commands for controlling task execution, the control module being configured to enable the computer to, in response to receipt of at least one task execution control command to cancel execution of a task sequence for which at least one task has been buffered but for which execution has not begun, enable the task execution module to not execute tasks from that task sequence that have been buffered.

224. A computer program product as defined in clause 223 in which the control module is configured to enable the computer to enable the task execution module to resume execution of at least one task associated with a task sequence subsequent to the task sequence for which at least one task has been buffered but for which execution has not begun.

225. A computer program product as defined in clause 219, the control module being configured to enable the computer to, in response to receipt of a command to become a member of a synchrony group, enable the interface module to receive tasks for execution by the task execution module.

226. A computer program product as defined in clause 225 in which the control module is configured to enable the computer to, in response to receipt of a command to become a member of a synchrony group, enable the interface module to receive tasks currently being transmitted using a selected multi-cast transmission methodology, and further to retrieve at least one previously distributed task using a selected unicast transmission methodology.

227. A computer program product as defined in clause 219 in which the control module is configured to enable the computer to, in receipt of a command to disengage from a synchrony group, disable the interface module from receiving tasks and the task execution module from executing previously received tasks that have not yet been executed.

228. A computer program product as defined in clause 219 further comprising a user interface module interface module configured to receive control information from a user interface module, the control module being configured to enable the computer to enable selected operations to be performed in response to the control information.

229. A computer program product as defined in clause 228 in which, in response to control information to enable another device to become a member of the device's synchrony group, the control module enables the interface module to transmit a command to the other device to enable the other device to become a member of the synchrony group.

230. A computer program product as defined in clause 228 in which, in response to control information to enable another device that is a member of the device's synchrony group to disengage from the synchrony group, the control module enables the interface module to transmit a command to the other device to enable the other device to disengage from the synchrony group.

231. A computer program product as defined in clause 228 in which, in response to control information to enable the task source to begin operating, the control module performs selected operations to enable the task source to

begin operating.

232. A computer program product as defined in clause 231, the device also operating as the task source, the device including a task generator module configured to enable the computer to, under control of the control module, obtain information from which the tasks are to be generated and generate the tasks.

233. A computer program product as defined in clause 232 in which the interface module is further configured to enable the computer to transmit the tasks to at least one other device.

234. A computer program product as defined in clause 232 in which the device is not the task source, the control module being configured to enable the computer to enable the interface module to transmit a command to enable the task source to operate.

235. A computer program product as defined in clause 234 in which tasks are divided into a series of task sequences, and, in response to receipt of control information enabling execution of a sequence of tasks currently being executed to be terminated, the control module is configured to enable the computer to enable the interface module to transmit a command to enable the task source to insert a resynchronize command in the series of tasks associated with the task sequence to enable termination of execution of the task sequence.

236. A computer program product as defined in clause 234 in which tasks are divided into a series of task sequences, and, in response to receipt of control information enabling execution of a sequence of tasks at least a portion of which have been received, but which are not being executed, the control module is configured to enable the computer to enable the interface module to transmit a command to enable the task source to insert a resynchronize command in the series of commands to disable execution of the task sequence.

237. A computer program product as defined in clause 228 in which the control module is configured to enable the computer to enable the user interface module interface module to transmit status information to the user interface module.

238. A computer program product as defined in clause 237 in which the status information includes the execution status of at least one task.

239. A computer program product as defined in clause 218 further including:

A. a migration information receiving module configured to enable the computer to receive migration information from the task source device, the migration information including a source for information respecting the tasks to be distributed, timing information relative to the clock maintained by the task source device and identifications of the member devices of the synchrony group, and
B. a migration control module configured to enable the computer to, after the migration information has been received.,

i. distribute the series of tasks to the synchrony group, each task being associated with a time stamp indicating a time, relative to the timing information that it receives from the device operating as the task source device, at which the devices comprising the synchrony group are to execute the respective task, and
ii. notify the members of the synchrony group that it is to thereafter operate as the task source device.

240. A computer program product as defined in clause 239 in which the information respecting the tasks that are to be distributed is a source of streaming information, the migration control module being configured to enable the computer to, after the migration information has been received, assemble the streaming information into tasks and associate each task with a said time stamp.

241. A computer program product as defined in clause 239 in which the information respecting the tasks that are to be distributed is in a file identified in the migration information, the migration control module being configured to enable the computer to obtain information from the identified file, assemble the information into tasks and associate each task with a said time stamp.

242. A computer program product as defined in clause 241 in which the information respecting the tasks that are to be distributed begins at an offset, identified in the migration information, into the identified file, the migration control

module being configured to enable the computer to assemble the information from a position in the file associated with the identified offset.

243. A computer program product as defined in clause 241 in which the information respecting the tasks that are to be distributed is in a series of files identified in the migration information, the migration control module being configured to enable the computer to obtain information from successive files in the series assemble the information into tasks and associate each task with as said time stamp.

244. A computer program product as defined in clause 218 further including a clock rate adjustment module configured to enable the computer to adjust the member device's clock rate in relation to a clock rate value maintained by the task source device's clock.

245. A computer program product as defined in clause 244 in which the clock rate adjustment module is configured to enable the computer to adjust the clock rate in relation to time stamps associated with respective ones of the tasks received from the task source device.

246. A computer program product for use in connection with a computer to provide a task source device for distributing a series of tasks for execution by at least one other device at respective execution times, the computer program product comprising a computer readable medium having encoded thereon:

A. a task acquisition module configured to enable the computer to obtain respective ones of the tasks;
B. a task execution time determination module configured to enable the computer to determine a time at which each respective task is to be executed, and to associate the respective task with a time stamp indicating its execution time;
C. a task transmission module configured to enable the computer to transmit the series of tasks to said at least one other device; and
D. an execution control command generation module configured to enable the computer to, in response to a predetermined event, enable the task transmission module to insert into the series of tasks transmitted by the task transmission module a command to enable the at least one other device to modify the execution sequence of the tasks transmitted thereto.

247. A computer program product as defined in clause 246 which the task transmission module is configured to enable the computer to utilize a selected multi-cast transmission methodology.

248. A computer program product as defined in clause 246 in which the predetermined event comprises input indicia provided by an operator.

249. A computer program product as defined in clause 246 in which, in response to said predetermined event, the execution control command generation module is configured to enable the computer to enable the task transmission module to insert into the series of tasks transmitted by the task transmission module a command to enable the at least one other device to control execution of at least one task in relation to the time the predetermined event occurs.

250. A computer program product as defined in clause 249 in which, in response to said predetermined event, the execution control command generation module is configured to enable the computer to enable the task transmission module to insert into the series of tasks transmitted by the task transmission module a command to enable the at least one other device to terminate execution of a task that it is currently executing and/or to not execute at least one task that is to be executed subsequent to the predetermined event.

251. A computer program product as defined in clause 249 in which the series of tasks includes a series of task sequences with each task sequence including a sub-set of the series of tasks, the execution control command generation module being configured to enable the computer to, in response to said predetermined event,

(i) enable the task transmission module to insert into the series of tasks transmitted by the task transmission module, a command enabling the at least one other device to terminate execution of the currently executing task and/or to not execute at least one subsequent task, if any, in the task sequence including the currently executing task; and
(ii) enable

(a) the task execution time determination module to provide that time stamps associated with tasks of task sequences subsequent to the task sequence currently being executed will reflect the termination and/or non-execution of tasks from the task sequence of the task that is currently being executed, and
(b) the task transmission module to transmit the tasks of the subsequent task sequences to the at least one other device.

252. A computer program product as defined in clause 251 in which the task transmission module is configured to enable the computer to insert a command to enable the at least one other device to not execute all tasks in the task sequence subsequent to the terminated and/or non-executed task.

253. A computer program product as defined in clause 246 in which, in response to said predetermined event, the execution control command generation module is configured to enable the computer to enable the task transmission module to insert into the series of tasks transmitted by the task transmission module a command to enable the at least one other device to control execution of a task in relation to the task's position in the series of tasks.

254. A computer program product as defined in clause 253 in which, in response to said predetermined event, the execution control command generation module is configured to enable the computer to enable the task transmission module to insert into the series of tasks transmitted by the task transmission module a command to enable the at least one other device to cancel execution of a task in relation to the task's position in the series of tasks.

255. A computer program product as defined in clause 254 in which, in response to said predetermined event, the execution control command generation module is configured to enable the computer to enable the task transmission module to insert into the series of tasks transmitted by the task transmission module a command to enable the at least one other device to cancel execution of a previously-transmitted task in relation to the task's position in the series of tasks.

256. A computer program product as defined in clause 255 in which, in response to said predetermined event, the execution control command generation module is configured to enable the computer to enable the task transmission module to insert into the series of tasks transmitted by the task transmission module a command to enable the at least one other device to cancel execution of a previously-transmitted task, in relation to the task's position in the series of tasks, for which execution has not begun.

257. A computer program product as defined in clause 253 in which the series of tasks includes a series of task sequences with each task sequence including a sub-set of the series of tasks, the execution control command generation module being configured to enable the computer to, in response to said predetermined event,

(i) enable the task transmission module to insert into the series of tasks transmitted by the task transmission module, a command enabling the at least one other device to cancel execution of a task sequence for which execution has not begun; and
(ii) enable

(a) the task execution time determination module to provide that time stamps associated with tasks of task sequences subsequent to the task sequence whose execution was cancelled will reflect the cancellation, and
(b) the task transmission module to transmit the tasks of the subsequent task sequences to the at least one other device.

258. A computer program product for use in connection with a computer to provide a task source device for distributing a series of tasks for execution by at least one other device at respective execution times, the computer program product comprising a computer readable medium having encoded thereon:

A. a task acquisition module configured to enable the computer to obtain respective ones of the tasks;
B. a task execution time determination module configured to enable the computer to determine a time at which each respective task is to be executed, and to associate the respective task with a time stamp indicating its execution time, the task execution time determination module being configured to enable the computer to provide, associated with at least one task, a time stamp indicating a task execution time later than the time currently indicated by a clock maintained by the task source device; and
C. a task transmission module configured to enable the computer to transmit the series of tasks to said at least one other device.

259. A computer program product as defined in clause 258 in which the task execution time determination module is configured to enable the computer to select the delay interval between the time indicated by the time stamp and the current time so to be sufficient to provide that the at least one task distributed by the task source device can be executed by the member devices at the time indicated by the time stamp.

260. A computer program product as defined in clause 259 in which the task execution time determination module is configured to enable the computer to select the delay interval between the time indicated by the time stamp and the current time so to be sufficient to provide that the at least one task distributed by the task source device can be distributed to the member devices for execution at the time indicated by the time stamp.

261. A computer program product as defined in clause 258 in which task acquisition module is configured to enable the computer to obtain information associated with the tasks from at least two types of information sources, the task execution time determination module being configured to enable the computer to select, for each task the delay interval between the time indicated by the time stamp and the current time based on the information source type that is associated with the respective task.

262. A computer program product for use in connection with a computer to provide a task source device for distributing a series of tasks for execution by at least one other device, the computer program product comprising a computer readable medium having encoded thereon:

A. a task acquisition module configured to enable the computer to obtain respective ones of the tasks;
B. a task execution time determination module configured to enable the computer to determine a time at which each respective task is to be executed, and to associate the respective task with a time stamp indicating its execution time;
C. a task transmission module configured to enable the computer to transmit the series of tasks to said at least one other device; and
D. a task source device migration control module configured to enable the computer to, in response to a pre-determined event, provide migration information to another device, the migration information including a source for information respecting the tasks to be distributed, timing information relative to the clock maintained by the task source device and identifications of the member devices of the synchrony group.

263. A system comprising a plurality of devices,

A one device being enabled to operate as a task source device, the task source device being enabled to transmit a series of tasks to the other devices, each task being associated with execution time information;
B. at least one device being enabled to operate as a task execution device, the task execution device being enabled to receive the series of tasks from the network and executing each respective task at a time in relation to the timing information associated with the respective task; and
C. one device being enabled to operate as a control device, the control device being enabled to control operations of the task source device and the task execution device.

264. A system as defined in clause 263 in which the device that is enabled to operate as the control device is also enabled to operate as a task execution device.

265. A system as defined in clause 263 in which the device that is enabled to operate as the control device is also enabled to operate as the task source device.

266. A system as defined in clause 263 in which the device that is enabled to operate as the task source device is also enabled to operate as a task execution device.

267. A system for facilitating processing of data by device operating as a member of a synchrony group, synchronously with a clock maintained by a data source device that provides the data to the synchrony group,

A. the data source device being configured to divide the data into a series of frames for distribution to the synchrony group, each frame being associated with a time stamp indicating a time, relative to a clock maintained by the data source device, at which the devices comprising the synchrony group are to process the frame;
B each member device in the synchrony group being configured to:

(i) periodically obtain from the data source device an indication of a current time value indicated by the data source device's clock;
(ii) receive the series of frames from the data source device;
(iii) determine, from the time stamp associated with each respective frame and a time differential value representing a difference between the current time value indicated by the data source device's clock, a current time value indicated by the member device's respective clock, a time, relative to the member device's respective clock, at which the member device is to process the frame; and
(iv) process the respective frame at the determined time.

268. A system as defined in clause 267 in which at least one frame comprises audio data, each member device, while processing each frame, producing sound represented by the respective frame.

269. A system as defined in clause 267 comprising a plurality of member devices, the member devices processing each frame synchronously in relation to the clock maintained by the data source device so that they all produce sound represented by the respective frame synchronously.

270. A system as defined in clause 269 in which the data source device is configured to provide time stamps for at least two successive frames so that the member devices will play them with a selected time interval therebetween.

271. A system as defined in clause 270 in which the time interval is zero.

272. A system as defined in clause 269 in which one of the member devices operates as a master device for the synchrony group, any other member devices comprising respective slave devices, the master device being configured to perform at least one type of synchrony group management operation in connection with the member devices comprising the synchrony group.

273. A system as defined in clause 272 in which the master device is further configured to provide status information relating to the status of the synchrony group to the user interface module.

274. A system as defined in clause 273 in which the status information includes identifications of the devices comprising the synchrony group.

275. A system as defined in clause 273 in which each frame is associated with a frame sequence, each frame sequence comprising at least one frame, the frame or frames comprising each frame sequence being associated with an audio track, each audio track being associated with an identifier, the status information including the identification of the audio track currently being played.

276. A system as defined in clause 272, the system comprising at least one additional device, in which, in one type of synchrony group management operation, the master device is configured to enable the at least one additional device to join the synchrony group as a slave device.

277. A system as defined in clause 276 in which the data source device is configured to distribute frames to the member devices using a selected multi-cast transmission methodology, the member devices being configured to buffer the frames until they are to be played, and further in which, when the at least one additional device joins the synchrony group as a slave device, the data source device is enabled to transmit at least one previously distributed frame to the slave device using a selected unicast transmission methodology.

278. A system as defined in clause 272 in which, in at least one type of synchrony group management operation, the master device is configured to enable the data source device to join the synchrony group as a slave device, the data source device continuing to operate as the data source device for the synchrony group.

279. A system as defined in clause 272 in which, in at least one type of synchrony group management operation, the master device is configured to enable a slave device to disengage from the synchrony group, the disengaged slave device thereafter not being a member device in the synchrony group and not playing frames distributed by the data source device.

280. A system as defined in clause 272 in which, in at least one type of synchrony group management operation, the master device is configured to control the series of frames to be distributed by the data source device.

281. A system as defined in clause 280 in which each frame is associated with a frame sequence, each frame sequence comprising at least one frame, the frame or frames comprising each frame sequence being associated with an audio track, the master device being configured to control the frames to be distributed by the data source device on a track-by-track basis.

282. A system as defined in clause 281 in which, in at least one type of synchrony group management operation, the master device is further configured to control playback by the member devices of the frames associated with the respective audio tracks that have been distributed by the data source device in response to control information from the user interface module.

283. A system as defined in clause 282 in which, in response to control information from the user interface module to facilitate control of playback by the member devices, the master device is configured to enable the data source device to distribute a playback control command to the member devices.

284. A system as defined in clause 283 in which a playback control command enables the member devices to terminate playback of a track that is currently being played back.

285. A system as defined in clause 284 in which the playback control command enables the member devices to terminate playback of a track with a frame subsequent to a frame currently being played.

286. A system as defined in clause 283 in which the playback control command enables the member devices to cancel playback of a track at least one of whose frames has been previously distributed, but for which playback has not begun.

287. A system as defined in clause 272 in which, in at least one type of synchrony group management operation, the member device operating as the master device is configured to enable the master device to migrate from itself to another member device in the synchrony group.

288. A system as defined in clause 272 in which, in at least one type of synchrony group management operation, the master device is configured to enable the data source device to migrate from one device to another device in the system.

289. A system as defined in clause 288 in which

A. the device operating as the data source device is configured to, after being enabled to migrate the data source device to said other device, provide migration information to the other device, the migration information including a source for information respecting the frames to be distributed, timing information relative to the clock maintained by the data source device and identifications of the member devices,
B. the other device being configured to, after receiving the migration information,

i. distribute the series of frames to the synchrony group, each frame being associated with a time stamp indicating a time, relative to the timing information that it receives from the device operating as the data source device, at which the devices comprising the synchrony group are to execute the respective frame, and
ii. notify the members of the synchrony group that it is to thereafter operate as the data source device.

290. A system as defined in clause 289 in which the information respecting the frames that are to be distributed is a source of streaming information, the other device being configured to, after receiving the migration information, assemble the streaming information into frames and associate each frame with a said time stamp.

291. A system as defined in clause 289 in which the information respecting the frames that are to be distributed is in a file identified in the migration information, the other device being configured to obtain information from the identified file, assemble the information into frames and associate each frame with a said time stamp.

292. A system as defined in clause 291 in which the information respecting the frames that are to be distributed begins at an offset, identified in the migration information, into the identified file, the other device being configured to assemble the information from a position in the file associated with the identified offset.

293. A system as defined in clause 291 in which the information respecting the frames that are to be distributed is

in a series of files identified in the migration information, the other device being configured to obtain information from successive files in the series assemble the information into frames and associate each frame with as said time stamp.

294. A system as defined in clause 267 in which the data source device is further configured to distribute the frames using a selected multi-cast message transmission methodology.

295. A system as defined in clause 267 in which the data source device is configured to provide, associated with at least one frame, a time stamp indicating a frame execution time later than the time currently indicated by the clock maintained by the data source device.

296. A system as defined in clause 295 in which the data source device is configured to select the delay interval between the time indicated by the time stamp and the current time so to be sufficient to provide that the at least one frame distributed by the data source device can be executed by the member devices at the time indicated by the time stamp.

297. A system as defined in clause 296 in which the data source device is configured to select the delay interval between the time indicated by the time stamp and the current time so to be sufficient to provide that the at least one frame distributed by the data source device can be distributed to the member devices for execution at the time indicated by the time stamp

298. A system as defined in clause 295 in which data source device is configured to obtain information associated with the frames from at least two types of information sources, the data source device being further configured to select, for each frame the delay interval between the time indicated by the time stamp and the current time based on the information source type that is associated with the respective frame.

299. A system as defined in clause 267 in which at least one member device is further configured to adjust its clock rate in relation to a clock rate value maintained by the data source device's clock.

300. A system as defined in clause 299 in which the at least one member device is configured to adjust its clock rate in relation to time stamps associated with respective ones of the frames received from the data source device.

301. A system as defined in clause 267 in which at least one other device operates as a data source device configured to distribute frames to a second synchrony group, the device operating as the data source device for the first synchrony group also operating as a member device of a second synchrony group.

302. A system as defined in clause 267 in which at least one member device comprises:

A. an interface module configured to receive the series of frames, each frame being associated with a time stamp, each time stamp indicating a time value relative to a time indicated a clock maintained by the data source, at which the device is to process the respective frame;
B. a current time retrieval module configured to obtain, from the data source, a current time value as indicated by the data source's clock;
C. an processing time determination module configured to determine, from the time stamp associated with each respective frame and a time differential value representing a difference between the current time value obtained by the current time retrieval module and a current time value indicated by a clock maintained by the device, a time, relative to the device's respective clock, at which the frame is to be processed; and
D. a frame processing module configured to process each respective frame at the time determined by the processing time determination module.

303. A system as defined in clause 302 in which the at least one frame comprises audio data, each member device, while processing each frame, producing a signal representing sound represented by the respective frame.

304. A system as defined in clause 302 further including a control module for controlling execution of commands received by said interface module.

305. A device as defined in clause 304 further comprising a buffer configured to buffer frames that the interface module has received until they are to be processed, the frame processing module being configured to process the

buffered frames at the times determined by the processing time determination module.

306. A system as defined in clause 305 in which the each frame is associated with a track, each track including at least one frame, the interface module being further configured to receive playback control commands for controlling processing of tracks, the control module being configured to execute at least one playback control command controlling track processing.

307. A system as defined in clause 306 in which at least one type of playback control command enables the control module to, in turn, enable the frame processing module to terminate playback of a track that is currently being played back.

308. A system as defined in clause 307 in which the playback control command enables the control module to terminate playback of a track with a frame subsequent to a frame currently being played.

309. A system as defined in clause 306 in which the playback control command enables the control module to cancel playback of a track at least one of whose frames has been previously distributed, but for which playback has not begun.

310. A system as defined in clause 306 in which the control module is configured to enable the frame processing module to resume processing of at least one frame associated with a subsequent track at a time determined by the processing time determination module.

311. A system as defined in clause 302 in which the member device includes:

A. a migration information receiving module configured to receive migration information from the task source device, the migration information including a source for information respecting the tasks to be distributed, timing information relative to the clock maintained by the task source device and identifications of the member devices of the synchrony group, and
B. a migration control module configure to, after the migration information has been received.,

i. distribute the series of tasks to the synchrony group, each task being associated with a time stamp indicating a time, relative to the timing information that it receives from the device operating as the task source device, at which the devices comprising the synchrony group are to execute the respective task, and
ii. notify the members of the synchrony group that it is to thereafter operate as the task source device.

312. A system as defined in clause 311 in which the information respecting the frames that are to be distributed is a source of streaming information, the migration control module being configured to, after the migration information has been received, assembling the streaming information into frames and associate each frame with a said time stamp.

313. A system as defined in clause 311 in which the information respecting the frames that are to be distributed is in a file identified in the migration information, the migration control module being configured to obtain information from the identified file, assemble the information into frames and associate each frame with a said time stamp.

314. A system as defined in clause 313 in which the information respecting the frames that are to be distributed begins at an offset, identified in the migration information, into the identified file, the migration control module being configured to assemble the information from a position in the file associated with the identified offset.

315. A system as defined in clause 313 in which the information respecting the frames that are to be distributed is in a series of files identified in the migration information, the migration control module being configured to obtain information from successive files in the series assemble the information into frames and associate each frame with as said time stamp.

316. A system as defined in clause 302 in which the member device further includes a clock rate adjustment module configured to adjust the member device's clock rate in relation to a clock rate value maintained by the data source device's clock.

317. A system as defined in clause 316 in which the clock rate adjustment module is configured to adjust the clock rate in relation to time stamps associated with respective ones of the frames received from the data source device.

318. A system as defined in clause 267 in which the data source device comprises:

A. a frame acquisition module configured to obtain respective ones of the frames;
B. a frame execution time determination module configured to determine a time at which each respective frame is to be executed, and to associate the respective frame with a time stamp indicating its execution time;
C. a frame transmission module configured to transmit the series of frames to said at least one other device; and
D. an execution control command generation module configured to, in response to a predetermined event, enable the frame transmission module to insert into the series of frames transmitted by the frame transmission module a command to enable the at least one other device to modify the execution sequence of the frames transmitted thereto.

319. A system as defined in clause 318 in which at least one frame comprises audio data, each member device, while processing each frame, producing generating a signal representing sound represented by the respective frame.

320. A system as defined in clause 318 in which the frame transmission module is configured to utilize a selected multi-cast transmission methodology.

321. A system as defined in clause 318 in which the predetermined event comprises input indicia provided by an operator.

322. A system as defined in clause 321 in which, in response to said predetermined event, the execution control command generation module is configured to enable the frame transmission module to insert into the series of frames transmitted by the frame transmission module a command to enable the at least one other device to control execution of at least one frame in relation to the time the predetermined event occurs.

323. A system as defined in clause 322 in which, in response to said predetermined event, the execution control command generation module is configured to enable the frame transmission module to insert into the series of frames transmitted by the frame transmission module a command to enable the at least one other device to terminate execution of a frame that it is currently executing and/or to not execute at least one frame that is to be executed subsequent to the predetermined event.

324. A data source device as defined in clause 323 in which the series of frames includes a series of frame sequences with each frame sequence including a sub-set of the series of frames, the execution control command generation module being configured to, in response to said predetermined event,

(i) enable the frame transmission module to insert into the series of frames transmitted by the frame transmission module, a command enabling the at least one other device to terminate execution of the currently executing frame and/or to not execute at least one subsequent frame, if any, in the frame sequence including the currently executing frame; and
(ii) enable

(a) the frame execution time determination module to provide that time stamps associated with frames of frame sequences subsequent to the frame sequence currently being executed will reflect the termination and/or non-execution of frames from the frame sequence of the frame that is currently being executed, and
(b) the frame transmission module to transmit the frames of the subsequent frame sequences to the at least one other device.

325. A system as defined in clause 324 in which the frame transmission module is configured to insert a command to enable the at least one other device to not execute all frames in the frame sequence subsequent to the terminated and/or non-executed frame.

326. A system as defined in clause 267 in which, in response to said predetermined event, the execution control command generation module is configured to enable the frame transmission module to insert into the series of frames transmitted by the frame transmission module a command to enable the at least one other device to control execution of a frame in relation to the frame's position in the series of frames.

327. A system as defined in clause 326 in which, in response to said predetermined event, the execution control command generation module is configured to enable the frame transmission module to insert into the series of

frames transmitted by the frame transmission module a command to enable the at least one other device to cancel execution of a frame in relation to the frame's position in the series of frames.

328. A system as defined in clause 326 in which, in response to said predetermined event, the execution control command generation module is configured to enable the frame transmission module to insert into the series of frames transmitted by the frame transmission module a command to enable the at least one other device to cancel execution of a previously-transmitted frame in relation to the frame's position in the series of frames.

329. A system as defined in clause 328 in which, in response to said predetermined event, the execution control command generation module is configured to enable the frame transmission module to insert into the series of frames transmitted by the frame transmission module a command to enable the at least one other device to cancel execution of a previously-transmitted frame, in relation to the frame's position in the series of frames, for which execution has not begun.

330. A system as defined in clause 327 in which the series of frames includes a series of frame sequences with each frame sequence including a sub-set of the series of frames, the execution control command generation module being configured to, in response to said predetermined event,

(i) enable the frame transmission module to insert into the series of frames transmitted by the frame transmission module, a command enabling the at least one other device to cancel execution of a frame sequence for which execution has not begun; and
(ii) enable

(a) the frame execution time determination module to provide that time stamps associated with frames of frame sequences subsequent to the frame sequence whose execution was cancelled will reflect the cancellation, and
(b) the frame transmission module to transmit the frames of the subsequent frame sequences to the at least one other device.

331. A system as defined in clause 267 in which the data source device comprises:

A. a frame acquisition module configured to obtain respective ones of the frames;
B. a frame execution time determination module configured to determine a time at which each respective frame is to be executed, and to associate the respective frame with a time stamp indicating its execution time;
C. a frame transmission module configured to transmit the series of frames to said at least one other device; and
D. a data source device migration control module configured to, in response to a predetermined event, provide migration information to another device, the migration information including a source for information respecting the frames to be distributed, timing information relative to the clock maintained by the data source device and identifications of the member devices of the synchrony group.

332. A system as defined in clause 331 in which the data source device is configured to provide, associated with at least one frame, a time stamp indicating a frame execution time later than the time currently indicated by the clock maintained by the data source device.

333. A system as defined in clause 332 in which the data source device is configured to select the delay interval between the time indicated by the time stamp and the current time so to be sufficient to provide that the at least one frame distributed by the data source device can be executed by the member devices at the time indicated by the time stamp.

334. A system as defined in clause 333 in which the data source device is configured to select the delay interval between the time indicated by the time stamp and the current time so to be sufficient to provide that the at least one frame distributed by the data source device can be distributed to the member devices for execution at the time indicated by the time stamp

335. A system as defined in clause 333 in which data source device is configured to obtain information associated with the frames from at least two types of information sources, the data source device being further configured to select, for each frame the delay interval between the time indicated by the time stamp and the current time based on the information source type that is associated with the respective frame.

336. A device for processing a series of frames of data provided by a data source at times specified by the data source in relation to a clock maintained by the data source, the device comprising

A. an interface module configured to receive the series of frames, each frame being associated with a time stamp, each time stamp indicating a time value relative to a time indicated a clock maintained by the data source, at which the device is to process the respective frame;
B. a current time retrieval module configured to obtain, from the data source, a current time value as indicated by the data source's clock;
C. an processing time determination module configured to determine, from the time stamp associated with each respective frame and a time differential value representing a difference between the current time value obtained by the current time retrieval module and a current time value indicated by a clock maintained by the device, a time, relative to the device's respective clock, at which the frame is to be processed; and
D. a frame processing module configured to process each respective frame at the time determined by the processing time determination module.

337. A device as defined in clause 336 in which the frame comprises audio data, each member device, while processing each frame, producing a signal representing sound represented by the respective frame.

338. A device as defined in clause 336 further including a control module for controlling execution of commands received by said interface module.

339. A device as defined in clause 336 further comprising a buffer configured to buffer frames that the interface module has received until they are to be processed, the frame processing module being configured to process the buffered frames at the times determined by the processing time determination module.

340. A device as defined in clause 339 in which the each frame is associated with a track, each track including at least one frame, the interface module being further configured to receive playback control commands for controlling processing of tracks, the control module being configured to execute at least one playback control command controlling track processing.

341. A device as defined in clause 340 in which at least one type of playback control command enables the control module to, in turn, enable the frame processing module to terminate playback of a track that is currently being played back.

342. A device as defined in clause 341 in which the playback control command enables the control module to terminate playback of a track with a frame subsequent to a frame currently being played.

343. A device as defined in clause 340 in which the playback control command enables the control module to cancel playback of a track at least one of whose frames has been previously distributed, but for which playback has not begun.

344. A device as defined in clause 340 in which the control module is configured to enable the frame processing module to resume processing of at least one frame associated with a subsequent track at a time determined by the processing time determination module.

345. A device as defined in clause 338, the control module being configured to, in response to receipt of a command to become a member of a synchrony group, enable the interface module to receive frames for processing by the frame processing module.

346. A device as defined in clause 345 in which the control module is configured to, in response to receipt of a command to become a member of a synchrony group, enable the interface module to receive frames currently being transmitted using a selected multi-cast transmission methodology, and further to retrieve at least one previously distributed frame using a selected unicast transmission methodology.

347. A device as defined in clause 346 in which the control module is configured to, in receipt of a command to disengage from a synchrony group, disable the interface module from receiving frames and the frame processing module from processing previously received frames that have not yet been processed.

348. A device as defined in clause 336 further comprising a user interface module interface module configured to

receive control information from a user interface module, the control module being configured to enable selected operations to be performed in response to the control information.

349. A device as defined in clause 348 in which, in response to control information to enable another device to become a member of the device's synchrony group, the control module enables the interface module to transmit a command to the other device to enable the other device to become a member of the synchrony group.

350. A device as defined in clause 349 in which, in response to control information to enable another device that is a member of the device's synchrony group to disengage from the synchrony group, the control module enables the interface module to transmit a command to the other device to enable the other device to disengage from the synchrony group.

351. A device as defined in clause 348 in which, in response to control information to enable the data source to begin operating, the control module performs selected operations to enable the data source to begin operating.

352. A device as defined in clause 351, the device also operating as the data source, the device including a frame generator module configured to, under control of the control module, obtain information from which the frames are to be generated and generate the frames.

353. A device as defined in clause 342 in which the interface module is further configured to transmit the frames to at least one other device.

354. A device as defined in clause 343 in which the device is not the data source, the control module being configured to enable the interface module to transmit a command to enable the data source to operate.

355. A device as defined in clause 354 in which each frame is associated with a track, each track including at least one frame, and, in response to receipt of control information enabling processing of a track currently being processed to be terminated, the control module is configured to enable the interface module to transmit a command to enable the data source to insert a resynchronize command in the series of frames associated with the track to enable termination of processing of the track.

356. A device as defined in clause 354 in which each frame is associated with a track, each track including at least one frame, and, in response to receipt of control information enabling processing of a track at least a portion of which has been received, but for which processing has not begun, the control module is configured to enable the interface module to transmit a command to enable the data source to insert a resynchronize command in the series of commands to disable processing of the track.

357. A device as defined in clause 344 in which the control module is configured to enable the user interface module interface module to transmit status information to the user interface module.

358. A device as defined in clause 357 in which the status information includes the processing status of at least one frame.

359. A device as defined in clause 336 further including:

A. a migration information receiving module configured to receive migration information from the data source device, the migration information including a source for information respecting the frames to be distributed, timing information relative to the clock maintained by the data source device and identifications of the member devices of the synchrony group, and
B. a migration control module configured to, after the migration information has been received.,

i. distribute the series of frames to the synchrony group, each frame being associated with a time stamp indicating a time, relative to the timing information that it receives from the device operating as the data source device, at which the devices comprising the synchrony group are to execute the respective frame, and
ii. notify the members of the synchrony group that it is to thereafter operate as the data source device.

360. A device as defined in clause 359 in which the information respecting the frames that are to be distributed is a source of streaming information, the migration control module being configured to, after the migration information

has been received, assembling the streaming information into frames and associate each frame with a said time stamp.

361. A device as defined in clause 359 in which the information respecting the frames that are to be distributed is in a file identified in the migration information, the migration control module being configured to obtain information from the identified file, assemble the information into frames and associate each frame with a said time stamp.

362. A device as defined in clause 361 in which the information respecting the frames that are to be distributed begins at an offset, identified in the migration information, into the identified file, the migration control module being configured to assemble the information from a position in the file associated with the identified offset.

363. A device as defined in clause 361 in which the information respecting the frames that are to be distributed is in a series of files identified in the migration information, the migration control module being configured to obtain information from successive files in the series assemble the information into frames and associate each frame with as said time stamp.

364. A device as defined in clause 336 further including a clock rate adjustment module configured to adjust the member device's clock rate in relation to a clock rate value maintained by the data source device's clock.

365. A data source device for distributing a series of frames for execution by at least one other device at respective execution times, the data source device comprising:

A. a frame acquisition module configured to obtain respective ones of the frames;
B. a frame execution time determination module configured to determine a time at which each respective frame is to be executed, and to associate the respective frame with a time stamp indicating its execution time;
C. a frame transmission module configured to transmit the series of frames to said at least one other device; and
D. an execution control command generation module configured to, in response to a predetermined event, enable the frame transmission module to insert into the series of frames transmitted by the frame transmission module a command to enable the at least one other device to modify the execution sequence of the frames transmitted thereto.

366. A data source device as defined in clause 365 in which the frame transmission module is configured to utilize a selected multi-cast transmission methodology.

367. A data source device as defined in clause 365 in which the predetermined event comprises input indicia provided by an operator.

368. A data source device as defined in clause 367 in which, in response to said predetermined event, the execution control command generation module is configured to enable the frame transmission module to insert into the series of frames transmitted by the frame transmission module a command to enable the at least one other device to control execution of at least one frame in relation to the time the predetermined event occurs.

369. A data source device as defined in clause 368 in which, in response to said predetermined event, the execution control command generation module is configured to enable the frame transmission module to insert into the series of frames transmitted by the frame transmission module a command to enable the at least one other device to terminate execution of a frame that it is currently executing and/or to not execute at least one frame that is to be executed subsequent to the predetermined event.

370. A data source device as defined in clause 368 in which the series of frames includes a series of frame sequences with each frame sequence including a sub-set of the series of frames, the execution control command generation module being configured to, in response to said predetermined event,

(i) enable the frame transmission module to insert into the series of frames transmitted by the frame transmission module, a command enabling the at least one other device to terminate execution of the currently executing frame and/or to not execute at least one subsequent frame, if any, in the frame sequence including the currently executing frame; and
(ii) enable

(a) the frame execution time determination module to provide that time stamps associated with frames of frame sequences subsequent to the frame sequence currently being executed will reflect the termination and/or non-execution of frames from the frame sequence of the frame that is currently being executed, and
(b) the frame transmission module to transmit the frames of the subsequent frame sequences to the at least one other device.

371. A data source device as defined in clause 370 in which the frame transmission module is configured to, insert a command to enable the at least one other device to not execute all frames in the frame sequence subsequent to the terminated and/or non-executed frame.

372. A data source device as defined in clause 362 in which, in response to said predetermined event, the execution control command generation module is configured to enable the frame transmission module to insert into the series of frames transmitted by the frame transmission module a command to enable the at least one other device to control execution of a frame in relation to the frame's position in the series of frames.

373. A data source device as defined in clause 372 in which, in response to said predetermined event, the execution control command generation module is configured to enable the frame transmission module to insert into the series of frames transmitted by the frame transmission module a command to enable the at least one other device to cancel execution of a frame in relation to the frame's position in the series of frames.

374. A data source device as defined in clause 371 in which, in response to said predetermined event, the execution control command generation module is configured to enable the frame transmission module to insert into the series of frames transmitted by the frame transmission module a command to enable the at least one other device to cancel execution of a previously-transmitted frame in relation to the frame's position in the series of frames.

375. A data source device as defined in clause 374 in which, in response to said predetermined event, the execution control command generation module is configured to enable the frame transmission module to insert into the series of frames transmitted by the frame transmission module a command to enable the at least one other device to cancel execution of a previously-transmitted frame, in relation to the frame's position in the series of frames, for which execution has not begun.

376. A data source device as defined in clause 371 in which the series of frames includes a series of frame sequences with each frame sequence including a sub-set of the series of frames, the execution control command generation module being configured to, in response to said predetermined event,

(i) enable the frame transmission module to insert into the series of frames transmitted by the frame transmission module, a command enabling the at least one other device to cancel execution of a frame sequence for which execution has not begun; and
(ii) enable

(a) the frame execution time determination module to provide that time stamps associated with frames of frame sequences subsequent to the frame sequence whose execution was cancelled will reflect the cancellation, and
(b) the frame transmission module to transmit the frames of the subsequent frame sequences to the at least one other device.

377. A data source device for distributing a series of frames for execution by at least one other device at respective execution times, the data source device comprising:

A. a frame acquisition module configured to obtain respective ones of the frames;
B. a frame execution time determination module configured to determine a time at which each respective frame is to be executed, and to associate the respective frame with a time stamp indicating its execution time, the frame execution time determination module being configured to provide, associated with at least one frame, a time stamp indicating a frame execution time later than the time currently indicated by a clock maintained by the data source device; and
C. a frame transmission module configured to transmit the series of frames to said at least one other device.

377. A system as defined in clause 377 in which the data source device is configured to select the delay interval

between the time indicated by the time stamp and the current time so to be sufficient to provide that the at least one frame distributed by the data source device can be executed by the member devices at the time indicated by the time stamp.

379. A system as defined in clause 378 in which the data source device is configured to select the delay interval between the time indicated by the time stamp and the current time so to be sufficient to provide that the at least one frame distributed by the data source device can be distributed to the member devices for execution at the time indicated by the time stamp

380. A system as defined in clause 377 in which data source device is configured to obtain information associated with the frames from at least two types of information sources, the data source device being further configured to select, for each frame the delay interval between the time indicated by the time stamp and the current time based on the information source type that is associated with the respective frame.

381. A data source device for distributing a series of frames for execution by at least one other device, the data source device comprising:

A. a frame acquisition module configured to obtain respective ones of the frames;
B. a frame execution time determination module configured to determine a time at which each respective frame is to be executed, and to associate the respective frame with a time stamp indicating its execution time;
C. a frame transmission module configured to transmit the series of frames to said at least one other device; and
D. a data source device migration control module configured to, in response to a predetermined event, provide migration information to another device, the migration information including a source for information respecting the frames to be distributed, timing information relative to the clock maintained by the data source device and identifications of the member devices of the synchrony group.

382. A method for operating a system to facilitate processing of data by device operating as a member of a synchrony group, synchronously with a clock maintained by a data source device that provides the data to the synchrony group, the method including the steps of

A. enabling the data source device being to divide the data into a series of frames for distribution to the synchrony group, each frame being associated with a time stamp indicating a time, relative to a clock maintained by the data source device, at which the devices comprising the synchrony group are to process the frame;
B enabling each member device in the synchrony group to:

(i) periodically obtain from the data source device an indication of a current time value indicated by the data source device's clock;
(ii) receive the series of frames from the data source device;
(iii) determine, from the time stamp associated with each respective frame and a time differential value representing a difference between the current time value indicated by the data source device's clock, a current time value indicated by the member device's respective clock, a time, relative to the member device's respective clock, at which the member device is to process the frame; and
(iv) process the respective frame at the determined time.

383. A method as defined in clause 382 in which at least one frame comprises audio data, each member device, while processing each frame, being enabled to generate a signal representing sound represented by the respective frame.

384. A method as defined in clause 382, the system comprising a plurality of member devices, the method including the steps of enabling the member devices to process each frame synchronously in relation to the clock maintained by the data source device so that they all produce sound represented by the respective frame synchronously.

385. A method as defined in clause 384 including the step of enabling the data source device to provide time stamps for at least two successive frames so that the member devices will play them with a selected time interval therebetween.

386. A method as defined in clause 385 in which the time interval is zero.

387. A method as defined in clause 382 in which one of the member devices operates as a master device for the synchrony group, any other member devices comprising respective slave devices, the method including the step of enabling the master device to perform at least one type of synchrony group management operation in connection with the member devices comprising the synchrony group.

388. A method as defined in clause 387, the method including the step of enabling the master device to perform at least one type of synchrony group management operation in response to control information provided thereto by a user interface module.

389. A method as defined in clause 388 further including the step of enabling the master device to provide status information relating to the status of the synchrony group to the user interface module.

390. A method as defined in clause 389 in which the status information includes identifications of the devices comprising the synchrony group.

391. A method as defined in clause 389 in which each frame is associated with a frame sequence, each frame sequence comprising at least one frame, the frame or frames comprising each frame sequence being associated with an audio track, each audio track being associated with an identifier, the status information including the identification of the audio track currently being played.

392. A method as defined in clause 388 the method comprising at least one additional device, in which, in one type of synchrony group management operation, the master device is configured to enable the at least one additional device to join the synchrony group as a slave device.

393. A method as defined in clause 392 in which the data source device is configured to distribute frames to the member devices using a selected multi-cast transmission methodology, the member devices being configured to buffer the frames until they are to be played, the method including the step of, when the at least one additional device joins the synchrony group as a slave device, the enabling the data source device to transmit at least one previously distributed frame to the slave device using a selected unicast transmission methodology.

394. A method as defined in clause 387 in which, in at least one type of synchrony group management operation, the method includes the step of enabling the master device to enable the data source device to join the synchrony group as a slave device, the data source device continuing to operate as the data source device for the synchrony group.

395. A method as defined in clause 387 in which, in at least one type of synchrony group management operation, the method includes the step of enabling the master device to enable a slave device to disengage from the synchrony group, the disengaged slave device thereafter not being a member device in the synchrony group and not playing frames distributed by the data source device.

396. A method as defined in clause 387 in which, in at least one type of synchrony group management operation, the method includes the step of enabling the master device to control the series of frames to be distributed by the data source device.

397. A method as defined in clause 387 in which each frame is associated with a frame sequence, each frame sequence comprising at least one frame, the frame or frames comprising each frame sequence being associated with an audio track, the method including the step of enabling the master device being configured to control the frames to be distributed by the data source device on a track-by-track basis.

398. A method as defined in clause 387 in which, in at least one type of synchrony group management operation, the method includes the step of enabling the master device to control playback by the member devices of the frames associated with the respective audio tracks that have been distributed by the data source device in response to control information from the user interface module.

399. A method as defined in clause 387 in which, in response to control information from the user interface module to facilitate control of playback by the member devices, the method includes the step of enabling the master device to enable the data source device to distribute a playback control command to the member devices.

400. A method as defined in clause 399 in which a playback control command enables the member devices to terminate playback of a track that is currently being played back.

401. A method as defined in clause 399 in which the playback control command enables the member devices to terminate playback of a track with a frame subsequent to a frame currently being played.

402. A method as defined in clause 399 in which the playback control command enables the member devices to cancel playback of a track at least one of whose frames has been previously distributed, but for which playback has not begun.

403. A method as defined in clause 387 in which, in at least one type of synchrony group management operation, the method includes the step of enabling the member device operating as the master device to enable the master device to migrate from itself to another member device in the synchrony group.

404. A method as defined in clause 403 in which, in at least one type of synchrony group management operation, the method includes the step of enabling the master device to enable the data source device to migrate from one device to another device in the system.

405. A method as defined in clause 404 in which

A. the device operating as the data source device is enable to perform the step of, after being enabled to migrate the data source device to said other device, providing migration information to the other device, the migration information including a source for information respecting the frames to be distributed, timing information relative to the clock maintained by the data source device and identifications of the member devices,
B. the other device is enabled to, after receiving the migration information, perform the steps of

i. distributing the series of frames to the synchrony group, each frame being associated with a time stamp indicating a time, relative to the timing information that it receives from the device operating as the data source device, at which the devices comprising the synchrony group are to execute the respective frame, and
ii. notifying the members of the synchrony group that it is to thereafter operate as the data source device.

406. A method as defined in clause 405 in which the information respecting the frames that are to be distributed is a source of streaming information, the other device being enabled to, after receiving the migration information, perform the steps of assembling the streaming information into frames and associating each frame with a said time stamp.

407. A method as defined in clause 405 in which the information respecting the frames that are to be distributed is in a file identified in the migration information, the other device being enabled to perform the steps of obtaining information from the identified file, assembling the information into frames and associating each frame with a said time stamp.

408. A method as defined in clause 407 in which the information respecting the frames that are to be distributed begins at an offset, identified in the migration information, into the identified file, the other device being enabled to perform the step of assembling the information from a position in the file associated with the identified offset.

409. A method as defined in clause 407 in which the information respecting the frames that are to be distributed is in a series of files identified in the migration information, the other device being enabled to perform the step of obtaining information from successive files in the series assemble the information into frames and associate each frame with as said time stamp.

410. A method as defined in clause 382 including the step in which the data source is further configured to distribute the frames using a selected multi-cast message transmission methodology, the device being enabled to receive the frames using the selected multi-cast message transmission methodology.

411. A method as defined in clause 382 in which the data source device is enabled to perform the step of providing, provide, associated with at least one frame, a time stamp indicating a frame execution time later than the time currently indicated by the clock maintained by the data source device.

412. A method as defined in clause 411 in which the data source device is enabled to perform the step of selecting the delay interval between the time indicated by the time stamp and the current time so to be sufficient to provide that the at least one frame distributed by the data source device can be executed by the member devices at the time indicated by the time stamp.

413. A method as defined in clause 411 in which the data source device is enabled to perform the step of selecting the delay interval between the time indicated by the time stamp and the current time so to be sufficient to provide that the at least one frame distributed by the data source device can be distributed to the member devices for execution at the time indicated by the time stamp

414. A method as defined in clause 411 in which data source device is enabled to perform the steps of obtaining information associated with the frames from at least two types of information sources, and selecting, for each frame, the delay interval between the time indicated by the time stamp and the current time based on the information source type that is associated with the respective frame.

415. A method as defined in clause 382 in which at least one member device is further enabled to perform the step of adjusting its clock rate in relation to a clock rate value maintained by the data source device's clock.

416. A method as defined in clause 415 in which the at least one member device is enabled to perform the step of adjusting its clock rate in relation to time stamps associated with respective ones of the frames received from the data source device.

417. A method as defined in clause 382 in which at least one other device operates as a data source device configured to distribute frames to a second synchrony group, the method including the steps of enabling the device to operate both as the data source device for the first synchrony group and also operating as a member device of a second synchrony group.

418. A method as defined in clause 382 including, within a member device,

A. a frame receiving step of receiving the series of frames,
B. a current time retrieval step of obtaining, from the data source device, the current time value as indicated by the frame source's clock;
C. an execution time determination step of determining, from the time stamp associated with each respective frame and a time differential value representing a difference between the current time value obtained during the current time retrieval step and a current time value indicated by a clock maintained by the device, a time, relative to the member device's respective clock at which the frame is to be executed; and
D. a frame execution step of executing each respective frame at the time determined during the execution time determination step.

419. A method as defined in clause 418 further including a control step for controlling execution of commands received during the frame receiving step

420. A method as defined in clause 419 in which the at least one member device further comprises a buffer configured to buffer frames received from the data source device during the frame receiving step until they are to be executed, the frame execution step including the step of executing the buffered frames at the times determined during the execution time determination step.

420. A method as defined in clause 420 in which the series of frames includes a series of frame sequences with each frame sequence including a subset of the series of frames, the frame receiving step being further enabled to receive frame execution control commands for controlling frame execution, the control step including the step of, in response to receipt of at least one frame execution control command for controlling frame execution, controlling the frame execution step to terminate execution of a frame sequence currently being executed, and further to not execute subsequent frames in the frame sequence that have been buffered.

422. A method as defined in clause 421 in which the control step includes the step of enabling the frame execution step to resume execution of at least one frame associated with a subsequent frame sequence at a time determined during the execution time determination step.

423. A method as defined in clause 420 in which the series of frames includes a series of frame sequences with each frame sequence including a subset of the series of frames, the frame receiving step including the step of receiving frame execution control commands for controlling frame execution, the control step including the step of, in response to receipt of at least one frame execution control command to cancel execution of a frame sequence for which at least one frame has been buffered but for which execution has not begun, providing that frames from that frame sequence that have been buffered not be executed.

424. A method as defined in clause 423 in which the control step includes the step of enabling execution to resume of at least one frame associated with a frame sequence subsequent to the frame sequence for which at least one frame has been buffered but for which execution has not begun.

425. A method as defined in clause 418 in which the member device performs:

A. migration information receiving step of receiving migration information from the data source device, the migration information including a source for information respecting the frames to be distributed, timing information relative to the clock maintained by the data source device and identifications of the member devices of the synchrony group, and
B. a migration control step of, after the migration information has been received.,

i. distributing the series of frames to the synchrony group, each frame being associated with a time stamp indicating a time, relative to the timing information that it receives from the device operating as the data source device, at which the devices comprising the synchrony group are to execute the respective frame, and
ii. notifying the members of the synchrony group that it is to thereafter operate as the data source device.

426. A method as defined in clause 425 in which the information respecting the frames that are to be distributed is a source of streaming information, the migration control step includes the steps of, after the migration information has been received, assembling the streaming information into frames and associating each frame with a said time stamp.

427. A method as defined in clause 425 in which the information respecting the frames that are to be distributed is in a file identified in the migration information, the migration control step including the steps of obtaining information from the identified file, assembling the information into frames and associating each frame with a said time stamp.

428. A method as defined in clause 427 in which the information respecting the frames that are to be distributed begins at an offset, identified in the migration information, into the identified file, the migration control step including the step of assembling the information from a position in the file associated with the identified offset.

429. A method as defined in clause 427 in which the information respecting the frames that are to be distributed is in a series of files identified in the migration information, the migration control step including the steps of obtaining information from successive files in the series assemble the information into frames and associating each frame with as said time stamp.

430. A method as defined in clause 418 in which the member device is further enabled to perform a clock rate adjustment step including the step of adjusting the member device's clock rate in relation to a clock rate value maintained by the data source device's clock.

431. A method as defined in clause 430 in which the clock rate adjustment step includes the step of determining adjust the clock rate in relation to time stamps associated with respective ones of the frames received from the data source device.

432. A method as defined in clause 382 of operating a device for distributing a series of frames for execution by at least one other device at respective execution times, the method comprising:

A. a frame acquisition step of obtaining respective ones of the frames;
B. a frame execution time determination step of determining a time at which each respective frame is to be executed, and to associate the respective frame with a time stamp indicating its execution time;
C. a frame transmission step of transmitting the series of frames to said at least one other device; and
D. an execution control command generation step of, in response to a predetermined event and during the

frame transmission step, the insertion into the series of frames transmitted by the frame transmission module of a command to enable the at least one other device to modify the execution sequence of the frames transmitted thereto.

433. A method as defined in clause 432 in which the frame transmission step includes the step of utilizing a selected multi-cast transmission methodology.

434. A method as defined in clause 432 in which the predetermined event includes the step of receiving input indicia provided by an operator.

435. A method as defined in clause 434 in which the execution control command generation step includes the step of enabling, in response to said predetermined event and during the frame transmission step, the insertion into the series of frames of a command to enable the at least one other device to control execution of at least one frame in relation to the time the predetermined event occurs.

436. A method as defined in clause 435 in which, the execution control command generation step includes the step of enabling, in response to said predetermined event and during the frame transmission step, the insertion into the series of frames of a command to enable the at least one other device to terminate execution of a frame that it is currently executing and/or to not execute at least one frame that is to be executed subsequent to the predetermined event.

437. A method as defined in clause 434 in which the series of frames includes a series of frame sequences with each frame sequence including a sub-set of the series of frames, the execution control command generation step including the steps of, in response to said predetermined event,

(i) enabling during the frame transmission step the insertion, into the series of frames, of a command enabling the at least one other device to terminate execution of the currently executing frame and/or to not execute at least one subsequent frame, if any, in the frame sequence including the currently executing frame; and
(ii) enabling

(a) during the frame execution time determination step, that time stamps associated with frames of frame sequences subsequent to the frame sequence currently being executed will reflect the termination and/or non-execution of frames from the frame sequence of the frame that is currently being executed, and
(b) during the frame transmission step, the transmission of the frames of the subsequent frame sequences to the at least one other device.

438. A method as defined in clause 437 in which the frame transmission step includes the step of inserting a command into the frame sequence to enable the at least one other device to not execute all frames in the frame sequence subsequent to the terminated and/or non-executed frame.

439. A method as defined in clause 435 in which the execution control command generation step include the step of enabling, in response to said predetermined event and during the frame transmission step, the insertion into the series of frames of a command to enable the at least one other device to control execution of a frame in relation to the frame's position in the series of frames.

440. A method as defined in clause 439 in which the execution control command generation step includes the step of, in response to said predetermined event and during the frame transmission step, the insertion into the series of frames of a command to enable the at least one other device to cancel execution of a frame in relation to the frame's position in the series of frames.

441. A method as defined in clause 439 in which the execution control command generation step includes the step of enabling, in response to said predetermined event and during the frame transmission step, the inserting into the series of frames of a command to enable the at least one other device to cancel execution of a previously-transmitted frame in relation to the frame's position in the series of frames.

442. A method as defined in clause 441 in which, the execution control command generation step includes the step of, in response to said predetermined event and during the frame transmission step, the insertion into the series of frames of a command to enable the at least one other device to cancel execution of a previously-transmitted frame,

in relation to the frame's position in the series of frames, for which execution has not begun.

443. A method as defined in clause 439 in which the series of frames includes a series of frame sequences with each frame sequence including a sub-set of the series of frames, the execution control command generation step including the steps of, in response to said predetermined event,

(i) enabling, during the frame transmission step, the insertion, into the series of frames, of a command enabling the at least one other device to cancel execution of a frame sequence for which execution has not begun; and
(ii) enabling

(a) during the frame execution time determination step, that time stamps associated with frames of frame sequences subsequent to the frame sequence whose execution was cancelled will reflect the cancellation, and
(b) during the frame transmission step, the transmission of the frames of the subsequent frame sequences to the at least one other device.

444. A method as defined in clause 382 in which the data source device is enabled to perform

A. a frame acquisition step of obtaining respective ones of the frames;
B. a frame execution time determination step of determining a time at which each respective frame is to be executed, and to associate the respective frame with a time stamp indicating its execution time;
C. a frame transmission step of transmitting the series of frames to said at least one other device; and
D. a data source device migration control step of, in response to a predetermined event, providing migration information to another device, the migration information including a source for information respecting the frames to be distributed, timing information relative to the clock maintained by the data source device and identifications of the member devices of the synchrony group.

445. A method as defined in clause 382 in which the data source device is enabled to perform the step of providing, associated with at least one frame, a time stamp indicating a frame execution time later than the time currently indicated by the clock maintained by the data source device.

446. A method as defined in clause 445 in which the data source device is enabled to perform the step of selecting the delay interval between the time indicated by the time stamp and the current time so to be sufficient to provide that the at least one frame distributed by the data source device can be executed by the member devices at the time indicated by the time stamp.

447. A method as defined in clause 446 in which the data source device is enabled to perform the step of selecting the delay interval between the time indicated by the time stamp and the current time so to be sufficient to provide that the at least one frame distributed by the data source device can be distributed to the member devices for execution at the time indicated by the time stamp.

448. A method as defined in clause 445 in which data source device is enabled to perform the step of obtaining information associated with the frames from at least two types of information sources, and selecting for each frame the delay interval between the time indicated by the time stamp and the current time based on the information source type that is associated with the respective frame.

449. A method of enabling a device to process a series of frames of data provided by a data source at times specified by the data source in relation to a clock maintained by the data source, the device comprising

A. an interface step of receiving the series of frames, each frame being associated with a time stamp, each time stamp indicating a time value relative to a time indicated a clock maintained by the data source, at which the device is to process the respective frame;
B. a current time retrieval step of obtaining, from the data source, a current time value as indicated by the data source's clock;
C. an processing time determination step of determining, from the time stamp associated with each respective frame and a time differential value representing a difference between the current time value obtained during the current time retrieval step and a current time value indicated by a clock maintained by the device, a time, relative to the device's respective clock, at which the frame is to be processed; and

D. a frame processing step of processing each respective frame at the time determined during the processing time determination step.

450. A method as defined in clause 449 in which at least one frame comprises audio data, each member device, while processing said at least one frame, generating a signal representing sound represented by the respective frame.

451. A method as defined in clause 449 further including a control step for controlling execution of commands received by said device.

452. A method as defined in clause 451 further comprising a buffer configured to buffer frames that the interface module has received until they are to be processed, the frame processing step including the step of processing the buffered frames at the times determined during the processing time determination step.

453. A method as defined in clause 451 in which the each frame is associated with a track, each track including at least one frame, the interface module being further configured to receive playback control commands for controlling processing of tracks, the method including the step of enabling the control module to execute at least one playback control command controlling track processing.

454. A method as defined in clause 453 including the step of, in response to at least one type of playback control command, enabling the control module to, in turn, enable the frame processing module to terminate playback of a track that is currently being played back.

455. A method as defined in clause 454 including the step of, in response to the playback control command, enabling the control module to terminate playback of a track with a frame subsequent to a frame currently being played.

456. A method as defined in clause 452 including the step of, in response to the playback control command, enabling the control module to cancel playback of a track at least one of whose frames has been previously distributed, but for which playback has not begun.

457. A method as defined in clause 453 including the step of enabling the control module to enable the frame processing module to resume processing of at least one frame associated with a subsequent track at a time determined by the processing time determination module.

458. A method as defined in clause 449 including the step of enabling the control module to, in response to receipt of a command to become a member of a synchrony group, enable the interface module to receive frames for processing by the frame processing module.

459. A method as defined in clause 458 including the step of enabling the control module to, in response to receipt of a command to become a member of a synchrony group, enable the interface module to receive frames currently being transmitted using a selected multi-cast transmission methodology, and further to retrieve at least one previously distributed frame using a selected unicast transmission methodology.

460. A method as defined in clause 449 including the step of enabling the control module to, in receipt of a command to disengage from a synchrony group, disable the interface module from receiving frames and the frame processing module from processing previously received frames that have not yet been processed.

461. A method as defined in clause 449, further including the steps of receiving control information from a user interface module, and enabling the control module to enable selected operations to be performed in response to the control information.

462. A method as defined in clause 461 including the step of, in response to control information to enable another device to become a member of the device's synchrony group, enabling the control module to enable the interface module to transmit a command to the other device to enable the other device to become a member of the synchrony group.

463. A method as defined in clause 461 including the step of, in response to control information to enable another device that is a member of the device's synchrony group to disengage from the synchrony group, enabling the control module to enable transmission of a command to the other device to enable the other device to disengage

from the synchrony group.

464. A method as defined in clause 461 including the step of, in response to control information to enable the data source to begin operating, enabling the control module to perform selected operations to enable the data source to begin operating.

465. A method as defined in clause 464, the device also operating as the data source, the method including a frame generator step of, under control of the control module, obtaining information from which the frames are to be generated and generating the frames.

466. A method as defined in clause 465 further comprising the step of transmitting the frames to at least one other device.

467. A method as defined in clause 465 in which the device is not the data source, the method including the step of enabling the control module to enable transmission of a command to enable the data source to operate.

468. A method as defined in clause 467 in which each frame is associated with a track, each track including at least one frame, and, in response to receipt of control information enabling processing of a track currently being processed to be terminated, the method including the step of enabling the control module to enable transmission of a command to enable the data source to insert a resynchronize command in the series of frames associated with the track to enable termination of processing of the track.

469. A method as defined in clause 467 in which each frame is associated with a track, each track including at least one frame, and, in response to receipt of control information enabling processing of a track at least a portion of which has been received, but for which processing has not begun, the method including the step of enabling the control module to enable transmission of a command to enable the data source to insert a resynchronize command in the series of commands to disable processing of the track.

470. A method as defined in clause 451 further including the step of enabling the control module to enable the user interface module interface module to transmit status information to the user interface module.

471. A method as defined in clause 470 in which the status information includes the processing status of at least one frame.

472. A method as defined in clause 469 in which the member device performs:

A. migration information receiving step of receiving migration information from the data source device, the migration information including a source for information respecting the frames to be distributed, timing information relative to the clock maintained by the data source device and identifications of the member devices of the synchrony group, and
B. a migration control step of, after the migration information has been received.,

i. distributing the series of frames to the synchrony group, each frame being associated with a time stamp indicating a time, relative to the timing information that it receives from the device operating as the data source device, at which the devices comprising the synchrony group are to execute the respective frame, and
ii. notifying the members of the synchrony group that it is to thereafter operate as the data source device.

473. A method as defined in clause 472 in which the information respecting the frames that are to be distributed is a source of streaming information, the migration control step includes the steps of, after the migration information has been received, assembling the streaming information into frames and associating each frame with a said time stamp.

474. A method as defined in clause 472 in which the information respecting the frames that are to be distributed is in a file identified in the migration information, the migration control step including the steps of obtaining information from the identified file, assembling the information into frames and associating each frame with a said time stamp.

475. A method as defined in clause 474 in which the information respecting the frames that are to be distributed begins at an offset, identified in the migration information, into the identified file, the migration control step including

the step of assembling the information from a position in the file associated with the identified offset.

476. A method as defined in clause 474 in which the information respecting the frames that are to be distributed is in a series of files identified in the migration information, the migration control step including the steps of obtaining information from successive files in the series assemble the information into frames and associating each frame with as said time stamp.

477. A method as defined in clause 449 in which the member device is further enabled to perform a clock rate adjustment step including the step of adjusting the member device's clock rate in relation to a clock rate value maintained by the data source device's clock.

478. A method as defined in clause 477 in which the clock rate adjustment step includes the step of determining adjust the clock rate in relation to time stamps associated with respective ones of the frames received from the data source device.

479. A method of operating a device for distributing a series of frames for execution by at least one other device at respective execution times, the method comprising:

A. a frame acquisition step of obtaining respective ones of the frames;
B. a frame execution time determination step of determining a time at which each respective frame is to be executed, and to associate the respective frame with a time stamp indicating its execution time;
C. a frame transmission step of transmitting the series of frames to said at least one other device; and
D. an execution control command generation step of, in response to a predetermined event and during the frame transmission step, the insertion into the series of frames transmitted by the frame transmission module of a command to enable the at least one other device to modify the execution sequence of the frames transmitted thereto.

480. A method as defined in clause 479 in which at least one frame comprises audio data.

481. A method as defined in clause 479 in which the frame transmission step includes the step of utilizing a selected multi-cast transmission methodology.

482. A method as defined in clause 479 in which the predetermined event includes the step of receiving input indicia provided by an operator.

483. A method as defined in clause 482 in which the execution control command generation step includes the step of enabling, in response to said predetermined event and during the frame transmission step, the insertion into the series of frames of a command to enable the at least one other device to control execution of at least one frame in relation to the time the predetermined event occurs.

484. A method as defined in clause 483 in which, the execution control command generation step includes the step of enabling, in response to said predetermined event and during the frame transmission step, the insertion into the series of frames of a command to enable the at least one other device to terminate execution of a frame that it is currently executing and/or to not execute at least one frame that is to be executed subsequent to the predetermined event.

485. A method as defined in clause 482 in which the series of frames includes a series of frame sequences with each frame sequence including a sub-set of the series of frames, the execution control command generation step including the steps of, in response to said predetermined event,

(i) enabling during the frame transmission step the insertion, into the series of frames, of a command enabling the at least one other device to terminate execution of the currently executing frame and/or to not execute at least one subsequent frame, if any, in the frame sequence including the currently executing frame; and
(ii) enabling

(a) during the frame execution time determination step, that time stamps associated with frames of frame sequences subsequent to the frame sequence currently being executed will reflect the termination and/or non-execution of frames from the frame sequence of the frame that is currently being executed, and

(b) during the frame transmission step, the transmission of the frames of the subsequent frame sequences to the at least one other device.

486. A method as defined in clause 485 in which the frame transmission step includes the step of inserting a command into the frame sequence to enable the at least one other device to not execute all frames in the frame sequence subsequent to the terminated and/or non-executed frame.

487. A method as defined in clause 479 in which the execution control command generation step include the step of enabling, in response to said predetermined event and during the frame transmission step, the insertion into the series of frames of a command to enable the at least one other device to control execution of a frame in relation to the frame's position in the series of frames.

488. A method as defined in clause 487 in which the execution control command generation step includes the step of, in response to said predetermined event and during the frame transmission step, the insertion into the series of frames of a command to enable the at least one other device to cancel execution of a frame in relation to the frame's position in the series of frames.

489. A method as defined in clause 487 in which the execution control command generation step includes the step of enabling, in response to said predetermined event and during the frame transmission step, the inserting into the series of frames of a command to enable the at least one other device to cancel execution of a previously-transmitted frame in relation to the frame's position in the series of frames.

490. A method as defined in clause 489 in which, the execution control command generation step includes the step of, in response to said predetermined event and during the frame transmission step, the insertion into the series of frames of a command to enable the at least one other device to cancel execution of a previously-transmitted frame, in relation to the frame's position in the series of frames, for which execution has not begun.

491. A method as defined in clause 488 in which the series of frames includes a series of frame sequences with each frame sequence including a sub-set of the series of frames, the execution control command generation step including the steps of, in response to said predetermined event,

(i) enabling, during the frame transmission step, the insertion, into the series of frames, of a command enabling the at least one other device to cancel execution of a frame sequence for which execution has not begun; and
(ii) enabling

(a) during the frame execution time determination step, that time stamps associated with frames of frame sequences subsequent to the frame sequence whose execution was cancelled will reflect the cancellation, and
(b) during the frame transmission step, the transmission of the frames of the subsequent frame sequences to the at least one other device.

492. A method of operating a device for distributing a series of frames for execution by at least one other device at respective execution times, the method comprising:

A. a frame acquisition step of obtaining respective ones of the frames;
B. a frame execution time determination step of determining a time at which each respective frame is to be executed, and to associating the respective frame with a time stamp indicating its execution time, the frame execution time determination step including the step of providing, associated with at least one frame, a time stamp indicating a frame execution time later than the time currently indicated by a clock maintained by the data source device; and
C. a frame transmission step of transmitting the series of frames to said at least one other device.

493. A method as defined in clause 492 in which at least one frame comprises audio data.

494. A method as defined in clause 492 in which the frame execution time determination step includes the step of selecting the delay interval between the time indicated by the time stamp and the current time so to be sufficient to provide that the at least one frame distributed by the device can be executed by at least one other device at the time indicated by the time stamp.

495. A method as defined in clause 494 in which the frame execution time determination step includes the step of selecting the delay interval between the time indicated by the time stamp and the current time so to be sufficient to provide that the at least one frame distributed by the device can be distributed to other devices over a network for execution by the other devices at the time indicated by the time stamp.

496. A method as defined in clause 492 in which frame acquisition step includes the step of obtaining information associated with the frames from at least two types of information sources, the frame execution time determination step including the step of selecting, for each frame the delay interval between the time indicated by the time stamp and the current time based on the information source type that is associated with the respective frame.

497. A method of operating a device for distributing a series of frames for execution by at least one other device, the method comprising:

A. a frame acquisition module configured to obtain respective ones of the frames;
B. a frame execution time determination module configured to determine a time at which each respective frame is to be executed, and to associate the respective frame with a time stamp indicating its execution time;
C. a frame transmission module configured to transmit the series of frames to said at least one other device; and
D. a data source device migration control module configured to, in response to a predetermined event, provide migration information to another device, the migration information including a source for information respecting the frames to be distributed, timing information relative to the clock maintained by the data source device and identifications of the member devices of the synchrony group.

498. A method as defined in clause 497 in which at least one frame comprises audio data.

499. A computer program product for use in connection with a computer to provide a device for processing a series of frames of data provided by a data source at times specified by the data source in relation to a clock maintained by the data source, the computer program product comprising a computer-readable medium having encoded thereon

A. an interface module configured to enable the computer to receive the series of frames, each frame being associated with a time stamp, each time stamp indicating a time value relative to a time indicated a clock maintained by the data source, at which the device is to process the respective frame;
B. a current time retrieval module configured to enable the computer to obtain, from the data source, a current time value as indicated by the data source's clock;
C. an processing time determination module configured to enable the computer to determine, from the time stamp associated with each respective frame and a time differential value representing a difference between the current time value obtained by the current time retrieval module and a current time value indicated by a clock maintained by the device, a time, relative to the device's respective clock, at which the frame is to be processed; and
D. a frame processing module configured to enable the computer to process each respective frame at the time determined by the processing time determination module.

500. A computer program product as defined in clause 499 in which at least one frame comprises audio data, the computer, while processing said frame, generating a signal representing sound represented by the respective frame.

501. A computer program product as defined in clause 499 further including a control module a control module for enabling said computer to control execution of commands received by the interface module.

502. A computer program product as defined in clause 501 further comprising a buffer configured to enable the computer to buffer frames that the interface module has received until they are to be processed, the frame processing module being configured to enable the computer to process the buffered frames at the times determined by the processing time determination module.

503. A computer program product as defined in clause 502 in which the each frame is associated with a track, each track including at least one frame, the interface module being further configured to enable the computer to receive playback control commands for controlling processing of tracks, the control module being configured to enable the computer to execute at least one playback control command controlling track processing.

504. A computer program product as defined in clause 503 in which at least one type of playback control command

enables the control module to, in turn, enable the frame processing module to terminate playback of a track that is currently being played back.

505. A computer program product as defined in clause 504 in which the playback control command enables the control module to terminate playback of a track with a frame subsequent to a frame currently being played.

506. A computer program product as defined in clause 503 in which the playback control command enables the control module to cancel playback of a track at least one of whose frames has been previously distributed, but for which playback has not begun.

507. A computer program product as defined in clause 503 in which the control module is configured to enable the computer to enable the frame processing module to resume processing of at least one frame associated with a subsequent track at a time determined by the processing time determination module.

508. A computer program product as defined in clause 501, the control module being configured to enable the computer to, in response to receipt of a command to become a member of a synchrony group, enable the interface module to receive frames for processing by the frame processing module.

509. A computer program product as defined in clause 508 in which the control module is configured to enable the computer to, in response to receipt of a command to become a member of a synchrony group, enable the interface module to receive frames currently being transmitted using a selected multi-cast transmission methodology, and further to retrieve at least one previously distributed frame using a selected unicast transmission methodology.

510. A computer program product as defined in clause 501 in which the control module is configured to enable the computer to, in receipt of a command to disengage from a synchrony group, disable the interface module from receiving frames and the frame processing module from processing previously received frames that have not yet been processed.

511. A computer program product as defined in clause 501 further comprising a user interface module interface module configured to receive control information from a user interface module, the control module being configured to enable the computer to enable selected operations to be performed in response to the control information.

512. A computer program product as defined in clause 511 in which, in response to control information to enable another device to become a member of the device's synchrony group, the control module enables the interface module to transmit a command to the other device to enable the other device to become a member of the synchrony group.

513. A computer program product as defined in clause 511 in which, in response to control information to enable another device that is a member of the device's synchrony group to disengage from the synchrony group, the control module enables the interface module to transmit a command to the other device to enable the other device to disengage from the synchrony group.

514. A computer program product as defined in clause 511 in which, in response to control information to enable the data source to begin operating, the control module performs selected operations to enable the data source to begin operating.

515. A computer program product as defined in clause 514, the device also operating as the data source, the device including a frame generator module configured to enable the computer to, under control of the control module, obtain information from which the frames are to be generated and generate the frames.

516. A computer program product as defined in clause 515 in which the interface module is further configured to enable the computer to transmit the frames to at least one other device.

517. A computer program product as defined in clause 515 in which the device is not the data source, the control module being configured to enable the computer to enable the interface module to transmit a command to enable the data source to operate.

518. A computer program product as defined in clause 517 in which each frame is associated with a track, each

track including at least one frame, and, in response to receipt of control information enabling processing of a track currently being processed to be terminated, the control module is configured to enable the computer to enable the interface module to transmit a command to enable the data source to insert a resynchronize command in the series of frames associated with the track to enable termination of processing of the track.

519. A computer program product as defined in clause 517 in which each frame is associated with a track, each track including at least one frame, and, in response to receipt of control information enabling processing of a track at least a portion of which has been received, but for which processing has not begun, the control module is configured to enable the computer to enable the interface module to transmit a command to enable the data source to insert a resynchronize command in the series of commands to disable processing of the track.

520. A computer program product as defined in clause 517 in which the control module is configured to enable the computer to enable the user interface module interface module to transmit status information to the user interface module.

521. A computer program product as defined in clause 520 in which the status information includes the processing status of at least one frame.

522. A computer program product as defined in clause 499 further including:

A. a migration information receiving module configured to enable the computer to receive migration information from the data source device, the migration information including a source for information respecting the frames to be distributed, timing information relative to the clock maintained by the data source device and identifications of the member devices of the synchrony group, and
B. a migration control module configured to enable the computer to, after the migration information has been received.,

i. distribute the series of frames to the synchrony group, each frame being associated with a time stamp indicating a time, relative to the timing information that it receives from the device operating as the data source device, at which the devices comprising the synchrony group are to execute the respective frame, and
ii. notify the members of the synchrony group that it is to thereafter operate as the data source device.

523. A computer program product as defined in clause 522 in which the information respecting the frames that are to be distributed is a source of streaming information, the migration control module being configured to enable the computer to, after the migration information has been received, assemble the streaming information into frames and associate each frame with a said time stamp.

524. A computer program product as defined in clause 522 in which the information respecting the frames that are to be distributed is in a file identified in the migration information, the migration control module being configured to enable the computer to obtain information from the identified file, assemble the information into frames and associate each frame with a said time stamp.

525. A computer program product as defined in clause 524 in which the information respecting the frames that are to be distributed begins at an offset, identified in the migration information, into the identified file, the migration control module being configured to enable the computer to assemble the information from a position in the file associated with the identified offset.

526. A computer program product as defined in clause 524 in which the information respecting the frames that are to be distributed is in a series of files identified in the migration information, the migration control module being configured to enable the computer to obtain information from successive files in the series assemble the information into frames and associate each frame with as said time stamp.

527. A computer program product as defined in clause 499 further including a clock rate adjustment module configured to enable the computer to adjust the member device's clock rate in relation to a clock rate value maintained by the data source device's clock.

528. A computer program product as defined in clause 527 in which the clock rate adjustment module is configured to enable the computer to adjust the clock rate in relation to time stamps associated with respective ones of the

frames received from the data source device.

529. A computer program product for use in connection with a computer to provide a data source device for distributing a series of frames for execution by at least one other device at respective execution times, the computer program product comprising a computer readable medium having encoded thereon:

A. a frame acquisition module configured to enable the computer to obtain respective ones of the frames;
B. a frame execution time determination module configured to enable the computer to determine a time at which each respective frame is to be executed, and to associate the respective frame with a time stamp indicating its execution time;
C. a frame transmission module configured to enable the computer to transmit the series of frames to said at least one other device; and
D. an execution control command generation module configured to enable the computer to, in response to a predetermined event, enable the frame transmission module to insert into the series of frames transmitted by the frame transmission module a command to enable the at least one other device to modify the execution sequence of the frames transmitted thereto.

530. A computer program product as defined in clause 529 in which at least one frame comprises audio data.

531. A computer program product as defined in clause 529 in which the frame transmission module is configured to enable the computer to utilize a selected multi-cast transmission methodology.

532. A computer program product as defined in clause 529 in which the predetermined event comprises input indicia provided by an operator.

533. A computer program product as defined in clause 529 in which, in response to said predetermined event, the execution control command generation module is configured to enable the computer to enable the frame transmission module to insert into the series of frames transmitted by the frame transmission module a command to enable the at least one other device to control execution of at least one frame in relation to the time the predetermined event occurs.

534. A computer program product as defined in clause 533 in which, in response to said predetermined event, the execution control command generation module is configured to enable the computer to enable the frame transmission module to insert into the series of frames transmitted by the frame transmission module a command to enable the at least one other device to terminate execution of a frame that it is currently executing and/or to not execute at least one frame that is to be executed subsequent to the predetermined event.

535. A computer program product as defined in clause 533 in which the series of frames includes a series of frame sequences with each frame sequence including a sub-set of the series of frames, the execution control command generation module being configured to enable the computer to, in response to said predetermined event,

(i) enable the frame transmission module to insert into the series of frames transmitted by the frame transmission module, a command enabling the at least one other device to terminate execution of the currently executing frame and/or to not execute at least one subsequent frame, if any, in the frame sequence including the currently executing frame; and
(ii) enable

(a) the frame execution time determination module to provide that time stamps associated with frames of frame sequences subsequent to the frame sequence currently being executed will reflect the termination and/or non-execution of frames from the frame sequence of the frame that is currently being executed, and
(b) the frame transmission module to transmit the frames of the subsequent frame sequences to the at least one other device.

536. A computer program product as defined in clause 535 in which the frame transmission module is configured to enable the computer to insert a command to enable the at least one other device to not execute all frames in the frame sequence subsequent to the terminated and/or non-executed frame.

537. A computer program product as defined in clause 529 in which, in response to said predetermined event, the

execution control command generation module is configured to enable the computer to enable the frame transmission module to insert into the series of frames transmitted by the frame transmission module a command to enable the at least one other device to control execution of a frame in relation to the frame's position in the series of frames.

538. A computer program product as defined in clause 537 in which, in response to said predetermined event, the execution control command generation module is configured to enable the computer to enable the frame transmission module to insert into the series of frames transmitted by the frame transmission module a command to enable the at least one other device to cancel execution of a frame in relation to the frame's position in the series of frames.

539. A computer program product as defined in clause 537 in which, in response to said predetermined event, the execution control command generation module is configured to enable the computer to enable the frame transmission module to insert into the series of frames transmitted by the frame transmission module a command to enable the at least one other device to cancel execution of a previously-transmitted frame in relation to the frame's position in the series of frames.

540. A computer program product as defined in clause 539 in which, in response to said predetermined event, the execution control command generation module is configured to enable the computer to enable the frame transmission module to insert into the series of frames transmitted by the frame transmission module a command to enable the at least one other device to cancel execution of a previously-transmitted frame, in relation to the frame's position in the series of frames, for which execution has not begun.

541. A computer program product as defined in clause 537 in which the series of frames includes a series of frame sequences with each frame sequence including a sub-set of the series of frames, the execution control command generation module being configured to enable the computer to, in response to said predetermined event,

(i) enable the frame transmission module to insert into the series of frames transmitted by the frame transmission module, a command enabling the at least one other device to cancel execution of a frame sequence for which execution has not begun; and
(ii) enable

(a) the frame execution time determination module to provide that time stamps associated with frames of frame sequences subsequent to the frame sequence whose execution was cancelled will reflect the cancellation, and
(b) the frame transmission module to transmit the frames of the subsequent frame sequences to the at least one other device.

542. A computer program product for use in connection with a computer to provide a data source device for distributing a series of frames for execution by at least one other device at respective execution times, the computer program product comprising a computer readable medium having encoded thereon:

A. a frame acquisition module configured to enable the computer to obtain respective ones of the frames;
B. a frame execution time determination module configured to enable the computer to determine a time at which each respective frame is to be executed, and to associate the respective frame with a time stamp indicating its execution time, the frame execution time determination module being configured to enable the computer to provide, associated with at least one frame, a time stamp indicating a frame execution time later than the time currently indicated by a clock maintained by the data source device; and
C. a frame transmission module configured to enable the computer to transmit the series of frames to said at least one other device.

543. A computer program product as defined in clause 542 in which the data is audio data.

544. A computer program product as defined in clause 542 in which the frame execution time determination module is configured to enable the computer to select the delay interval between the time indicated by the time stamp and the current time so to be sufficient to provide that the at least one frame distributed by the data source device can be executed by the member devices at the time indicated by the time stamp.

545. A computer program product as defined in clause 544 in which the frame execution time determination module is configured to enable the computer to select the delay interval between the time indicated by the time stamp and

the current time so to be sufficient to provide that the at least one frame distributed by the data source device can be distributed to the member devices for execution at the time indicated by the time stamp.

546. A computer program product as defined in clause 542 in which frame acquisition module is configured to enable the computer to obtain information associated with the frames from at least two types of information sources, the frame execution time determination module being configured to enable the computer to select, for each frame the delay interval between the time indicated by the time stamp and the current time based on the information source type that is associated with the respective frame.

547. A computer program product for use in connection with a computer to provide a data source device for distributing a series of frames for execution by at least one other device, the computer program product comprising a computer readable medium having encoded thereon:

A. a frame acquisition module configured to enable the computer to obtain respective ones of the frames;
B. a frame execution time determination module configured to enable the computer to determine a time at which each respective frame is to be executed, and to associate the respective frame with a time stamp indicating its execution time;
C. a frame transmission module configured to enable the computer to transmit the series of frames to said at least one other device; and
D. a data source device migration control module configured to enable the computer to, in response to a predetermined event, provide migration information to another device, the migration information including a source for information respecting the frames to be distributed, timing information relative to the clock maintained by the data source device and identifications of the member devices of the synchrony group.

548. A computer program product as defined in clause 547 in which the data is audio data.

## Claims

1. A playback device (21) comprising:

a network interface (41) configured to receive an audio stream from a source device (14(n)(s); 16(m)) over a network (12);
an audio reproduction device interface (36) configured to output the audio stream from one or more audio reproduction devices (15(n)(r));
a user interface module interface (44) configured to transmit, via the network interface (41), to a user interface module (13), status information pertaining to a status of a synchrony group (20), wherein the playback device (21) is a member of the synchrony group (20) along with at least one additional zone playback device (11(n)).

2. A playback device (21) according to claim 1, wherein the status information comprises an identification of members of the synchrony group (20).

3. A playback device (21) according to claim 2, wherein the status information further comprises an identification of said playback device (21) as being a master member of the synchrony group (20).

4. A playback device (21) according to claim 2 or claim 3, wherein the status information further comprises an identification of said at least one additional zone playback device (11(n)) as being a slave member of the synchrony group (20).

5. A playback device (21) according to any of claims 1 to 4, wherein the status information further comprises an identification of the audio that is currently being played by members of the synchrony group (20).

6. A playback device (21) according to any of claims 1 to 5, wherein the status information further comprises an identification of audio that is scheduled to be played by the members of the synchrony group (20).

7. A playback device (21) according to any of claims 1 to 6, wherein the user interface module interface (44) is further configured to transmit status information, via the network interface (41), to one or more additional user interface modules.

8. A playback device (21) according to any of claims 1 to 7, wherein the playback device (21) further comprises an audio information channel device (23), the audio information channel device (23) being configured to transmit the audio stream, via the network interface (41), to said at least one additional zone playback device (11(n)) in the synchrony group (20).

9. A method of controlling audio playback, comprising:

receiving, by a network interface (41), an audio stream from a source device (14(n)(s); 16(m)) over a network (12);
outputting, via an audio reproduction device interface (36), the audio stream from one or more audio reproduction devices (15(n)(r));
transmitting, by a user interface module interface (44) and via the network interface (41) to a user interface module (13), status information pertaining to a status of a synchrony group (20), wherein the playback device (21) is a member of the synchrony group (20) along with at least one additional zone playback device (11(n)).

10. A method according to claim 9, wherein the status information comprises an identification of members of the synchrony group (20).

11. A method according to claim 10, wherein the status information further comprises an identification of said playback device (21) as being a master member of the synchrony group (20).

12. A method according to claim 10 or claim 11, wherein the status information further comprises an identification of said at least one additional zone playback device (11(n)) as being a slave member of the synchrony group (20).

13. A method according to any of claims 9 to 12, wherein the status information further comprises an identification of the audio that is currently being played by members of the synchrony group (20).

14. A method according to any of claims 9 to 13, wherein the status information further comprises an identification of audio that is scheduled to be played by the members of the synchrony group (20).

15. A method according to any of claims 9 to 14, wherein the method further comprises transmitting status information, by the user interface module interface (44) and via the network interface (41), to one or more additional user interface modules.

16. A method according to any of claims 9 to 15, wherein the method further comprises transmitting, by an audio information channel device (23) of the playback device (21), and via the network interface, the audio stream to said at least one additional zone playback device (11(n)) in the synchrony group (20).

17. A computer program comprising a set of instructions which, when executed by a processor, or a set of processors, of a playback device (21), causes the playback device (21) to perform the method according to any of claims 9 to 16.

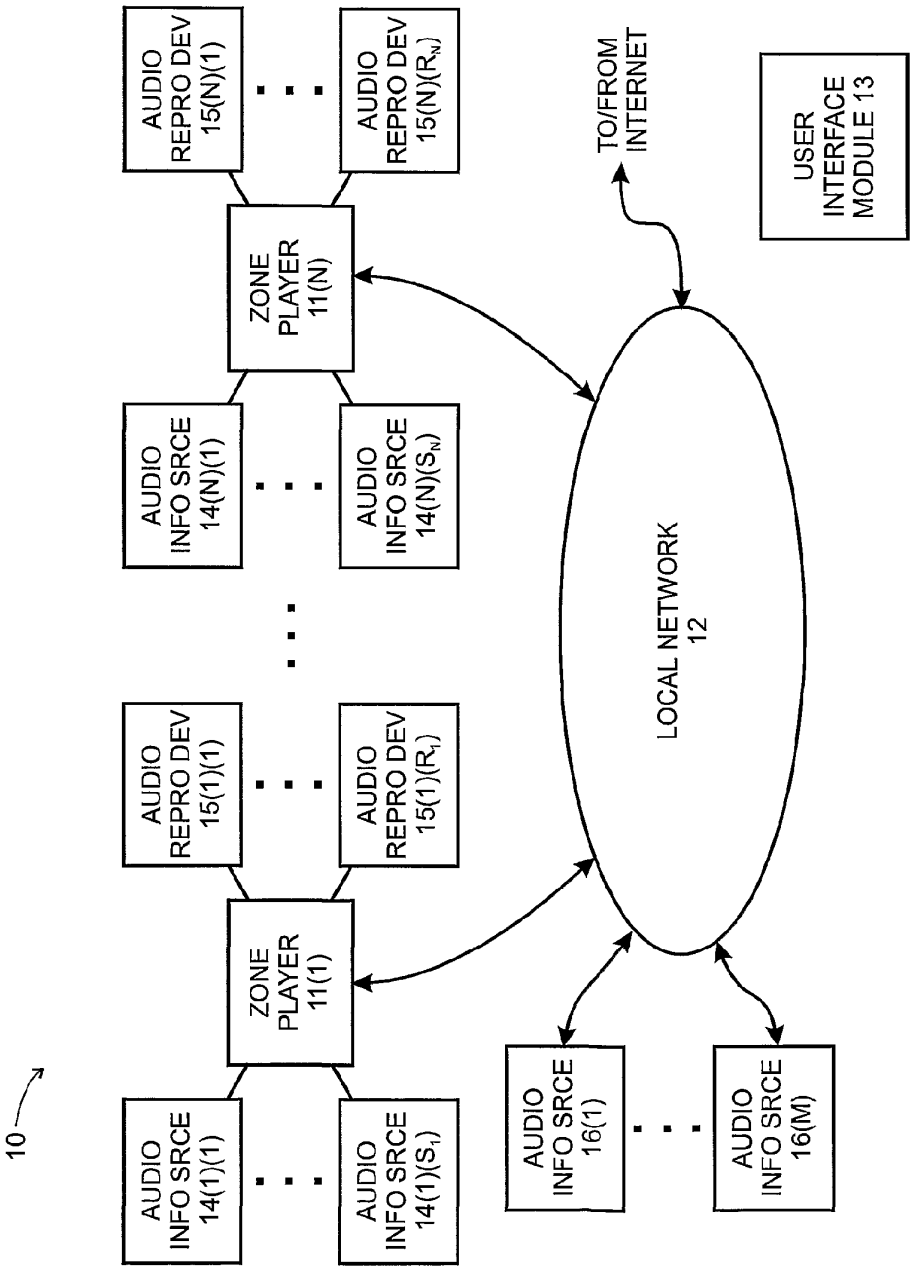

10
AUDIO INFO SRCE 14(1)(1)
AUDIO INFO SRCE 14(1)(S1)
AUDIO REPRO DEV 15(1)(1)
AUDIO REPRO DEV 15(1)(R1)
ZONE PLAYER 11(1)
AUDIO INFO SRCE 14(N)(1)
AUDIO INFO SRCE 14(N)(SN)
AUDIO REPRO DEV 15(N)(1)
AUDIO REPRO DEV 15(N)(RN)
ZONE PLAYER 11(N)
LOCAL NETWORK 12
TO/FROM INTERNET
USER INTERFACE MODULE 13
AUDIO INFO SRCE 16(1)
AUDIO INFO SRCE 16(M)

*FIG. 1*

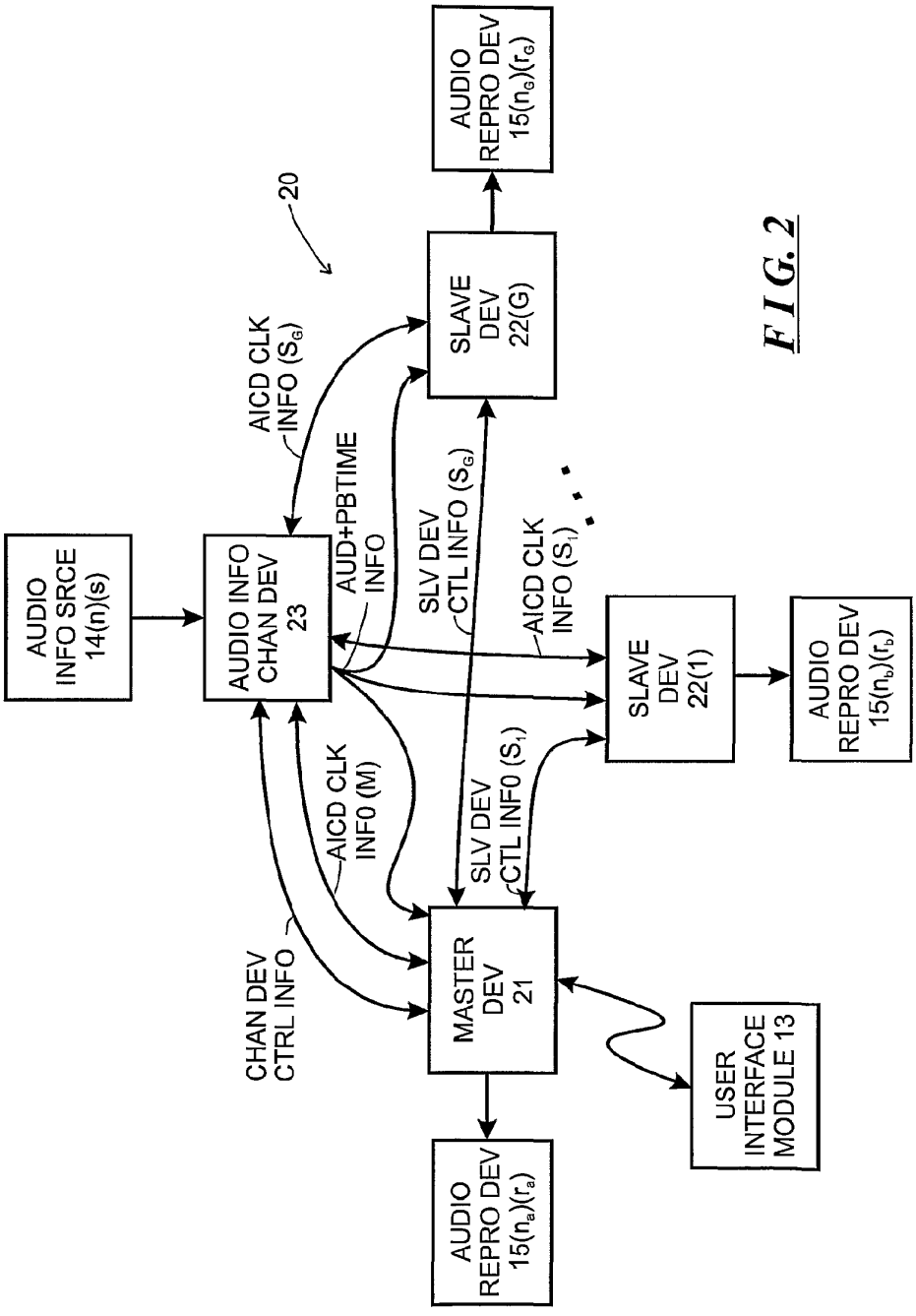

20
AUDIO INFO SRCE 14(n)(s)
AUDIO INFO CHAN DEV 23
AUD+PBTIME INFO
AICD CLK INFO ($S_G$)
SLV DEV CTL INFO ($S_G$)
AICD CLK INFO ($S_1$)
SLV DEV CTL INFO ($S_1$)
AICD CLK INFO (M)
CHAN DEV CTRL INFO
SLAVE DEV 22(G)
SLAVE DEV 22(1)
MASTER DEV 21
AUDIO REPRO DEV 15($n_G$)($r_G$)
AUDIO REPRO DEV 15($n_b$)($r_b$)
AUDIO REPRO DEV 15($n_a$)($r_a$)
USER INTERFACE MODULE 13

*FIG. 2*

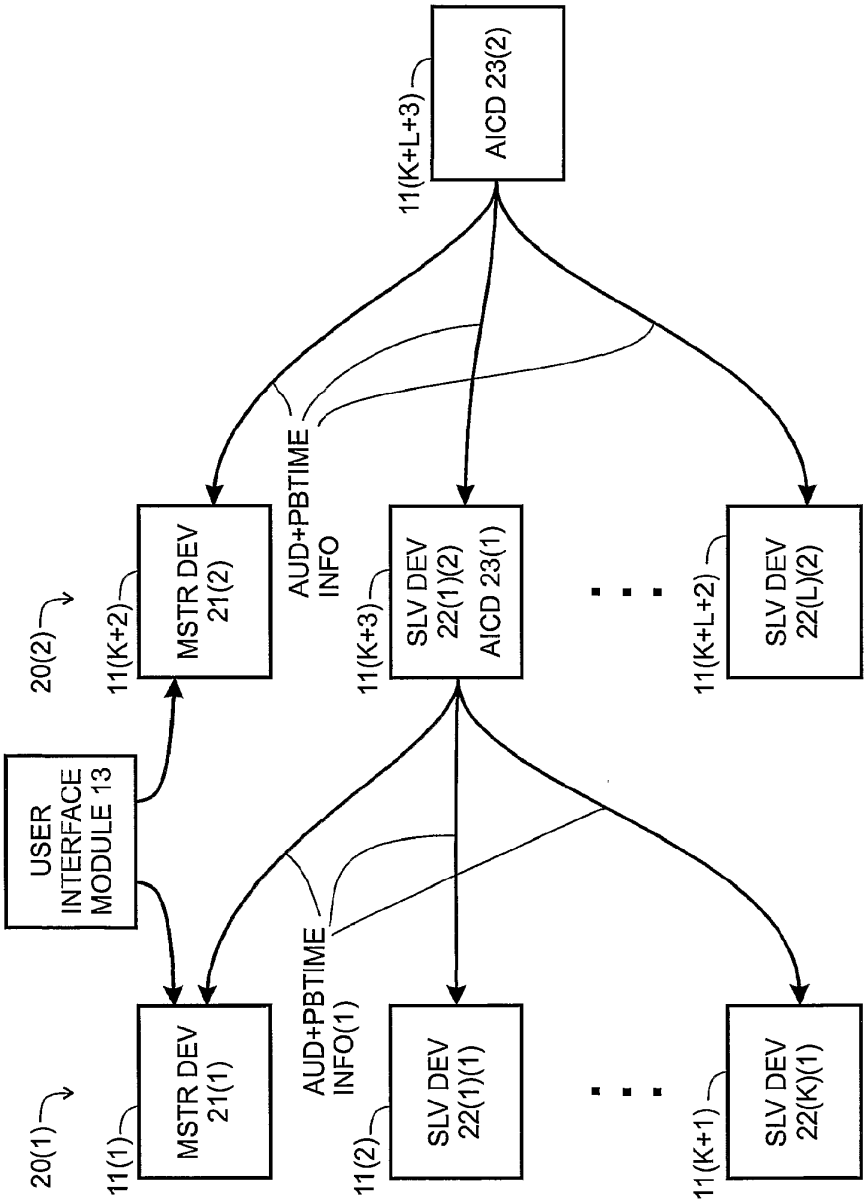

USER INTERFACE MODULE 13
20(1)
20(2)
11(1)
MSTR DEV 21(1)
11(2)
SLV DEV 22(1)(1)
11(K+1)
SLV DEV 22(K)(1)
11(K+2)
MSTR DEV 21(2)
11(K+3)
SLV DEV 22(1)(2) AICD 23(1)
11(K+L+2)
SLV DEV 22(L)(2)
11(K+L+3)
AICD 23(2)
AUD+PBTIME INFO(1)
AUD+PBTIME INFO

*FIG. 2A*

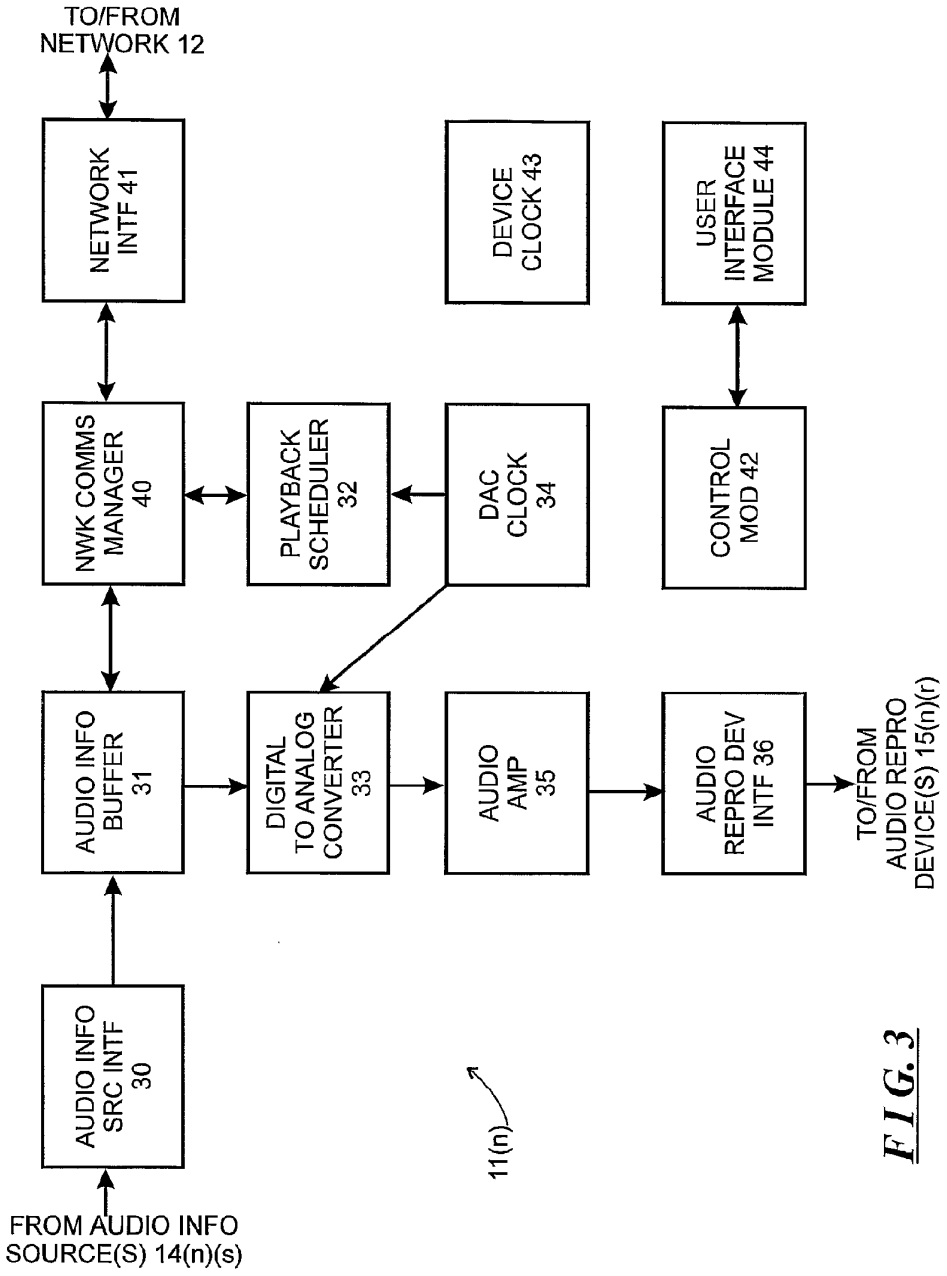

TO/FROM NETWORK 12
NETWORK INTF 41
DEVICE CLOCK 43
USER INTERFACE MODULE 44
NWK COMMS MANAGER 40
PLAYBACK SCHEDULER 32
DAC CLOCK 34
CONTROL MOD 42
AUDIO INFO BUFFER 31
DIGITAL TO ANALOG CONVERTER 33
AUDIO AMP 35
AUDIO REPRO DEV INTF 36
TO/FROM AUDIO REPRO DEVICE(S) 15(n)(r)
AUDIO INFO SRC INTF 30
11(n)
FROM AUDIO INFO SOURCE(S) 14(n)(s)

*FIG. 3*

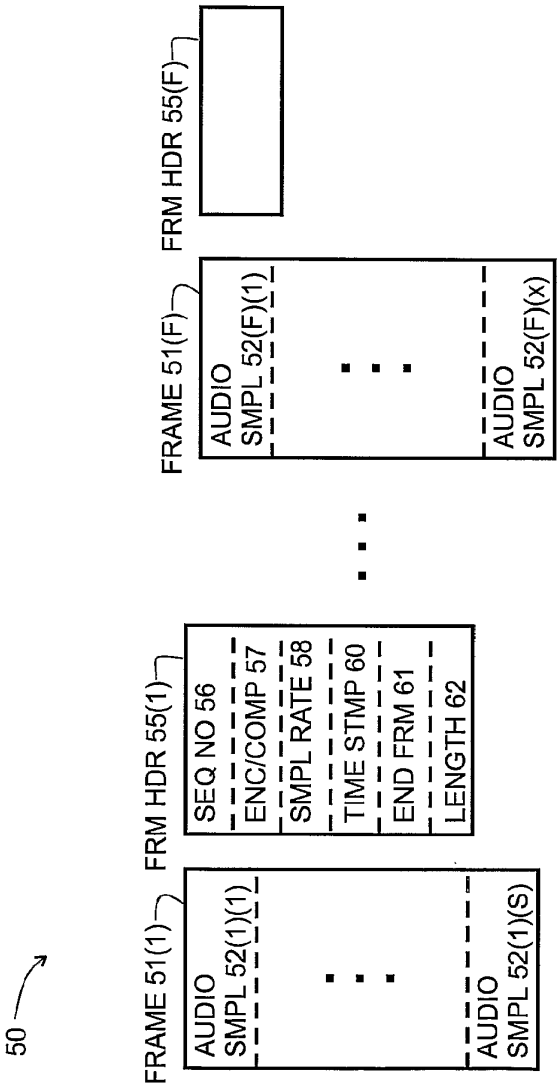

50
FRAME 51(1)
AUDIO SMPL 52(1)(1)
AUDIO SMPL 52(1)(S)
FRM HDR 55(1)
SEQ NO 56
ENC/COMP 57
SMPL RATE 58
TIME STMP 60
END FRM 61
LENGTH 62
FRAME 51(F)
AUDIO SMPL 52(F)(1)
AUDIO SMPL 52(F)(x)
FRM HDR 55(F)

*FIG. 4*

Europäisches Patentamt
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Office européen des brevets

# EUROPEAN SEARCH REPORT

Application Number
EP 13 18 4747

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The present search report has been drawn up for all claims

| Place of search | Date of completion of the search | Examiner |
|---|---|---|
| The Hague | 20 February 2014 | Meyer-Vitali, André |

CATEGORY OF CITED DOCUMENTS

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

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

& : member of the same patent family, corresponding document

EPO FORM 1503 03.82 (P04C01)

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Application Number
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The present search report has been drawn up for all claims

| Place of search | Date of completion of the search | Examiner |
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| The Hague | 20 February 2014 | Meyer-Vitali, André |

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X : particularly relevant if taken alone
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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
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& : member of the same patent family, corresponding document

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(25) Filing Language: English

(26) Publication Language: English

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| 09/563,173 | 2 May 2000 (02.05.2000) | US |
| 09/562,939 | 2 May 2000 (02.05.2000) | US |
| 09/563,104 | 2 May 2000 (02.05.2000) | US |

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| | |
|---|---|
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| Filed on | 24 January 2000 (24.01.2000) |
| US | 09/563,250 (CIP) |
| Filed on | 2 May 2000 (02.05.2000) |
| US | 09/563,173 (CIP) |
| Filed on | 2 May 2000 (02.05.2000) |
| US | 09/562,939 (CIP) |
| Filed on | 2 May 2000 (02.05.2000) |
| US | 09/563,104 (CIP) |
| Filed on | 2 May 2000 (02.05.2000) |

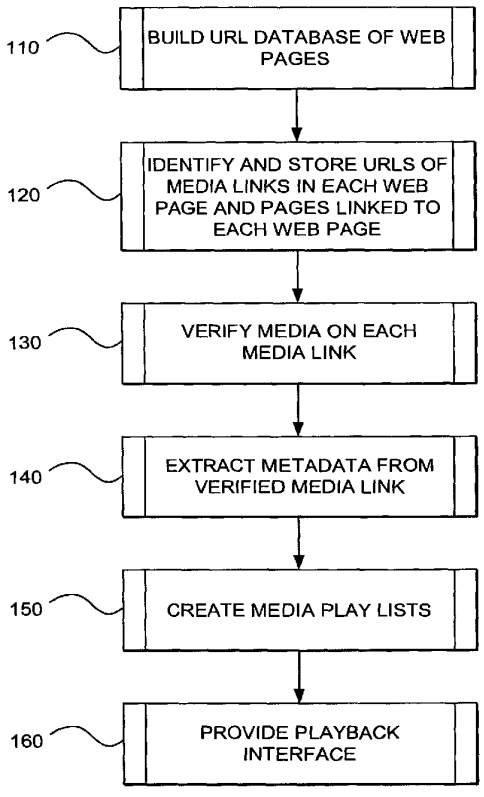
(71) Applicant *(for all designated States except US)*: **FRISKIT, INC.** [US/US]; Suite 124, 699 Mississippi Street, San Francisco, CA 94107 (US).

(72) Inventors; and

(75) Inventors/Applicants *(for US only)*: **EYAL, Aviv**

*[Continued on next page]*

(54) Title: STREAMING MEDIA SEARCH AND PLAYBACK SYSTEM




(57) Abstract: A method is provided for playing back media from a network. The method includes receiving a search criteria from a network enabled device. The method further includes accessing a database comprising a plurality of network addresses, where the database associates each address with one or more classes of information. The addresses in the database each access a media network resource. The method further includes selecting at least one address in the database using the search criteria, and signaling the selected address to the network enabled device. The method also includes controlling the network enabled device so as to automatically access and play back the media resource of the selected address.

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# STREAMING MEDIA SEARCH AND PLAYBACK SYSTEM

## BACKGROUND OF THE INVENTION

**Field of the Invention**

This invention relates to the field of streaming media content search and playback over a network. In particular, the invention relates to a computer system that enables a continuous streaming media playback from a distribution of sites available over a network such as the Internet.

**Description of the Related Art**

Computers currently can access streaming media on the Internet. Streaming media available on the Internet include, for example, music, video clips such as movie trailers, home movies, and animation.

Users locate streaming media on the Internet by manually selecting links. Typically, users browse the media sites that contain numerous sub-links. Users sometimes select through a chain of links to locate a desired media on a media link. Once located, the desired media link may or may not contain the desired media.

Some services provide media search engine capabilities. Users may enter a search request for selected media creations by an artist. The media search engine then displays links to categories and/or sub-links of media that are determined to match one or more criteria in the search request set forth by the user. The determination of which links should be displayed in response to the search request is dependent on the algorithm used in by the search engine. Typically, links displayed to users of current search engines are not subject to a determination of the quality or availability of the media associated with the media links. Further, the search results are outputted to the user as a display of links for the user's selection.

Many Internet streaming media outlets provide a limited number of source nodes. The sites can be unreliable when the number of users accessing the site become congested.

## SUMMARY OF THE INVENTION

An embodiment of the invention includes a method for playing back media from network. The method comprises receiving a search criteria from a network enabled device. The method further includes accessing a database comprising a plurality of network addresses, where the database associating each address with one or more classes of information. Each address accesses a media network resource. The method further includes selecting at least one address in the database using the search criteria, signaling the selected address to the network enabled device, and controlling the network enabled device so as to automatically access and play back the media resource of the selected address.

Another embodiment includes a method for playing back media from a network. The method includes receiving a request for media playback from a network enabled device. Further, accessing a database comprising a plurality of network addresses, where each address accessing a media network resource. The method also includes identifying at least two addresses from the database, signaling each identified address to the network enabled device, and controlling the network enabled device to access and automatically play back the media network resources of each of the signaled addresses.

In another embodiment, a computer system is provided for playing back media from a network. The computer system comprises a network enabled device comprising a media playback component. A database is included that comprises a plurality of addresses, where each address locates a media network resource on the network. The database includes one or more classes of information associated with each address in the plurality of addresses. The system also includes a network server module that is coupleable to the network enabled device and to the database. The network server module is able to receive a search request from the terminal that specifies one or more criterias. The network server module selects an address from the database that is associated with a class of information that matches the search criteria. The network server module signals the address to the network enabled device to cause the device to access the media network resource, and to signal media

playback component to load the media network resource after the device accesses the media network resource.

In another embodiment, a computer system is provided for playing back media from a network. The computer system includes a network enabled platform comprising a media playback component. A database includes a plurality of addresses, where each address locates a media network resource on the network. Each address accesses a media network resource. The embodiment further includes a network server module coupleable to the network enabled device and to the database. The network server receives a request for media playback from the network enabled device, selects multiple addresses from the database, and signal the multiple addresses to the network enabled device. The network server module control a media playback component on the network enabled device to use the addresses to automatically access and play back the media network resource associated with the addresses.

In another embodiment, a network enabled device is configured to playback media from a network. The network enabled device is coupleable over the network to a database that includes a plurality of addresses. Each address locates a media network resource on the network. The network enabled device includes a user-interface to prompt for a search request. The network interface signals the request to a network server module that is communicatable with the database, and receives one or more addresses in the database that match the search request. The network enabled device includes a media playback component that is configured to be programmatically controlled by the network server module to automatically load the media network resources located by the addresses that match the search request.

In another embodiment, a network enabled device is configured to playback media from a network. The network enabled device is coupleable over the network to a database comprising a plurality of addresses. Each address locates a media network resource on the network. The network enabled device comprises a user-interface including a plurality of user-interactive features, including a first user-interactive feature that prompts to receive a search request for media playback. A network interface signals the request to a network server module upon the first user-interactive feature receiving the

search request for media playback. The network interface is communicatable with the database to receive one or more addresses in the database that match the search request. A network playback component is configured to be programmatically controllable by the network server module to automatically load the media network resource associated with each address signaled to the network enabled device upon accessing the media network resource. A playback of the media playback component being controllable by one or more control user-interactive features.

An embodiment includes a system that provides media from a network to a terminal having a media playback component. The system includes a first network site and a second network site, where each network site locates one or more media network resources. Each media network resource is locatable on the network by a corresponding address that accesses the media network resource. A network server module is coupleable to the terminal through the network. The network server module identifies a first media network resource from the first network site and a second media network resource from the second network site. The network server module signals the corresponding address of the first media network resource to the terminal with control signals to cause the playback component to automatically load the first media network resource. The network server module automatically signals the corresponding address of the second media network resource to the terminal with control signals to cause the playback component to automatically load the second media network resource.

Another embodiment provides a media playback system for the Internet. The system includes an end terminal having a media playback component. A web server module is coupleable to the end terminal through the Internet. The web server module has access to one or more media web resources on a first web site, and to one or more media web resources on a second web site. The web server module signals a first link to a first media web resource on the first web site, and a second link to a second media web resource on the second web site. The web server module provides control signals to the end terminal to cause the end terminal to access and load the first media web resource and the second media web resource into the media playback component.

One or more of the embodiments may include a database that stores links to each of the plurality of media web resources, the web server module identifying the first link and the second link from the database.

Another embodiment includes a media playback system for the Internet. The system includes a terminal having a media playback component and a user-interface.

A web server module is coupleable to the user terminal through the Internet. The web server module has access to a plurality of links, where each link locates a media web resource. The plurality of links are accessible on a plurality of web sites. The web server module signals the plurality of links to the user terminal in a designated order to cause the terminal to load the media web resource located by each of the plurality of links into the media playback component. The embodiment also includes a database that stores the plurality of links. The database is accessible to signal the plurality of links to the web server module in the designated order. The user-interface signals one or more inputs from a user to the web server module. The one or more inputs direct the web server to alter the designated order in which the database signals the plurality of links to the web server module.

Another embodiment includes a system that provides media play-back on a network. The system includes a terminal that is coupleable to the network. A play-list module is coupleable to the terminal. The play-list module stores a first play-list signaled from the terminal. The first play-list includes a plurality of network addresses. A first network address locates a first media network resource on a first network site, and a second network address locates a second media network resource on a second network site. A network server module is coupleable to the terminal and to the play-list module. The network server module signals the first play-list to the terminal. The network server module controls the terminal to cause the terminal to access the media network resource associated with each network address in the first play-list, and to automatically load each respective media network resources into the media playback component.

Another embodiment includes a method for providing media to a terminal coupled to a network, where the terminal includes a media playback

component. A terminal is programmatically directed to access a first network site in the plurality of network sites. The media playback component on the terminal is caused to automatically load a first media web resource located at the first network site to playback a first media. The terminal is programmatically directed to access a second network site in the plurality of network sites. The media playback component on the terminal is caused to automatically load a second media web resource located at the second network site to playback a second media.

Another embodiment includes a method to provide media to a terminal coupled to the Internet. A database is accessed that stores a plurality of links, where each link opening a corresponding media web resource. A first link is selected from the database, the first link being located on a first network site. Next, a second link is selected from the database, the second link being located in a second network site. The second network site is external to the first network site. Then, the selected links are signaled to a media playback component on the terminal to sequentially access the media web resources associated with the selected links. The media playback component on the terminal is automatically signaled to load each of the media web resource accessed from the selected links so as to playback a media corresponding to each media web resource.

Another embodiment includes a system to share media playback from a network between a plurality of terminals. The plurality of terminals include a first terminal and a second terminal. The system includes a play-list component locatable on the network by a selectable link. The play-list component identifies a plurality of links to form a play-list, where each link in the play-list locating a media file on the network. The system includes a network server module that signals the plurality of links that form the play-list to the first terminal. The network server module receives a signal to transmit the selectable link to a second terminal to enable the second terminal to locate the play-list module.

In another embodiment, a method is provided to locate web resources on the Internet. A web site is accessed to identify a plurality of links using a web browser component. The web site can be automatically or programmatically accessed. Each of the plurality of links are selectable to open a corresponding

web resource of a specified data type on the web site. The plurality of links are made available to a plurality of Internet enabled devices that select one or more of the links.

Another embodiment includes a system to locating web resources on the Internet. The system includes a web browser component, and a database. A search module controls the web browser component to access at least one web site. The search module controls the web browser component to identify a plurality of links to media web resources at the web site. Each of the plurality of links are selectable to open a media web resource. The search module stores the plurality of links in the database.

Another embodiment includes a method to locate web resources on the Internet. A database that stores a plurality of links is accessed, the plurality of links being selectable to open a corresponding web media resources. Metadata information is programmatically identified about the web media resource corresponding to each of the plurality of links. The plurality of links are made accessible to a plurality of Internet enabled devices. The plurality of Internet enabled devices elect one or more of the links to open the corresponding media web resource.

Another embodiment includes a method to locate web resources on the Internet. A database is accessed that includes a plurality of links to media web resources. Each of the plurality of links are programmatically verified to open a corresponding web media resource. Each verified link is accessible to a plurality of Internet enabled devices that select one or more of the links to open the corresponding media web resource.

Another embodiment includes a system to locate web resources on the Internet. The system includes a first indexed data structure comprising a plurality of links. A media playback component is coupleable to the database. The media playback component loads each of the plurality of links to verify whether the link is selectable to open a media web resource. A second indexed data structure stores each verified link in the plurality of links. The second indexed data structure is available to the plurality of Internet enabled devices.

Another embodiment includes a method to providing links for use in a media search engine. A plurality of internal links on a network site are

identified. The network site makes a network resource of a specific data type accessible for a network enabled device. The internal links that are selectable to open the network resource of the specific data type are extracted. The external link is stored in a database. One or more of the links are automatically signaled to a media playback component in response to receiving a search requests from the network enabled device.

Another embodiment includes a method to provide links for use in a media search engine. The method includes a) receiving from a first indexed data structure a first external link to a first network site; b) initializing a second data structure to be empty;

c) determining if the first network site contains at least one internal link; d) storing the at least one internal link contained on the first network site that is not in the first indexed data structure and not in the second indexed data structure as another external link in the first indexed data structure; e) identifying the internal links contained on the first network site that are selectable to open a network resource of a specific data type or types; f) moving the first external link from the first indexed data structure to the second indexed data structure; and g) repeating steps a) through f) until the first indexed data structure is empty.

Another embodiment includes a computer system to search for links to streaming media playback on a network, the network being accessible to a network enabled device. The system includes a metacrawler to locate one or more media sites in directories containing streaming media. A media search module coupled to be signaled the one or more directories from the metacrawler. The media search module identifies a plurality of media links for the media sites. Each of the plurality of media links are selectable to open streaming media network resource. A metadata extraction module accesses each media link identified by the media search engine to extract metadata about the identified media link. A database comprising the plurality of media links identified by the media search engine, and the metadata is extracted about each identified media link. The database enables the network enabled device to access the plurality of media links.

An embodiment includes a rating system for rating media network resources on a network that is coupleable to a plurality of terminals. The rating system includes a database having a plurality of addresses. Each address locates a corresponding media network resource on the network. A network server module is coupleable to the plurality of terminals. The network server module accesses the database to signal one or more addresses from the database to the plurality of terminals. A rating module is coupleable to the plurality of terminals. The rating module receives a rating input from each of the plurality of terminals. The rating module associates the rating input with a selected address in the database.

In another embodiment, a rating system is provided to rate media network resources on a network. The rating system includes a database comprising a plurality of addresses that each locate a corresponding media network resource on the network. The database includes one or more classes of information associated with each of the plurality of addresses. A network server module is coupleable to the plurality of terminals. The network server module communicates with each of the plurality of terminals to receive a search request. The network server module signals the database to retrieve one or more addresses from the database in response to the search request. The retrieved addresses are associated with a class of information matching the search request. A rating module is coupleable to the plurality of terminals. The rating module receives a rating input from each of the plurality of terminals. The rating module associates the rating input with a selected address in the database.

Another embodiment includes a rating system for rating media network resources available over a network. The media network resources are located on the network by a plurality of terminals. The rating system includes a database that stores a plurality of addresses. Each address locates a corresponding media network resource on the network. The database includes a rating associated with each of the plurality of addresses. A network server module is coupleable to each of the plurality of terminals. The network server module accesses the database to signal one or more addresses from the database to the plurality of terminals. A rating module is coupleable to each of the plurality of terminals. The rating module receives a rating input from one of the terminals for each of

the plurality of addresses in the database. In response to receiving the rating input from one of the plurality of terminals for a selected address in the database, the rating module accesses the database and reconfigures the rating associated with the selected address. A play-list module accesses the addresses to select one or more combinations of addresses. The play-list module signals the play-list to the network server module as addresses to be signaled to one or more of the plurality of terminals.

In a variation, the address may be selected by the play-list module based on a criteria stored with the address in the database. Examples of criterias include rankings, reflecting preferences of users on terminals after playing back media located by the respective addresses. Other criterias that can be used to select addresses include metadata information, such as artist name and media title. For example, the search request may specify a ranking as one of the criterias. The play-list module then sorts the database for the ranking in selecting the addresses.

Another embodiment includes a method for ranking media sources on a network. The method includes accessing a database that stores a plurality of addresses. Each address locates a media resource on the network and each address is associated with a rating. A selected address from the database is signaled to a terminal coupled to the network. A rating input is received from the terminal after signaling the selected address to the terminal. The rating is associated for the selected address is adjusted in response to receiving the rating input.

Another embodiment includes a method for ranking media sources on a network. A database is accessed that stores a plurality of addresses. Each address locates a media resource on the network and each address is associated with a rating. A combination of addresses are selected to form a play-list. The play-list is signaled to a terminal coupled to the network. A ranking is received from the terminal after signaling the addresses in the play-list to the terminal. The rating is adjusted for each address signaled to the terminal from the play-list in response to receiving the ranking.

Another embodiment includes a method that ranks media sources on a network. A database that stores a plurality of addresses is accessed. Each

address locates a media resource on the network, and each address is associated with a rating. A selected address is signaled from the database to a terminal coupled to the network. A ranking is received from the terminal after the selected address is signaled to the terminal. The rating associated for the selected address is adjusted in response to receiving the ranking.

Another embodiment includes a network enabled device that comprises a media playback component. The media playback component is configured to communicate with a network-side module to receive a first plurality of links. Each of the first plurality of links locate a media file on a network. A web browser component is configured to receive a second plurality of links. Each of the second plurality of links hosts a media file located by one of the first plurality of links. The web browser component displays the web site for each of the second plurality of links when the media playback component plays back media from the media file being hosted by web site being displayed.

## BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a flow process describing an embodiment of the invention.

FIG. 2 is a block diagram illustrating an architecture for use with an embodiment of the invention.

FIG. 3 is a block diagram illustrating a back end architecture, under an embodiment of the invention.

FIG. 4 is a block diagram illustrating a media search and playback system, under an embodiment of the invention.

FIG. 5 is a block diagram illustrating components on an end terminal receiving control information from a server-side module, under an embodiment of the invention.

FIG. 6 is a flow chart illustrating a system for forming a search database of media resources accessible on a network, under an embodiment of the invention.

FIG. 7 is a flow chart illustrating a system for forming a search database of media resources accessible on a network, under an embodiment of the invention.

FIG. 8 is a flow chart for verifying records in a search database of media resources, under an embodiment of the invention.

FIG. 9 is a flow chart for extracting metadata about a media resource associated with a site on a network, under an embodiment of the invention.

FIG. 10 is a flow chart for forming play-lists for end users of a system under an embodiment of the invention.

FIG. 11 is a flow chart for receiving user input in response to playing back media resources from a search database, under an embodiment of the invention.

FIG. 12 is a block diagram of a media playback system including a rating feature, under an embodiment of the invention.

FIG. 13 is a flow chart describing user input to a user interface for a media playback system, under an embodiment of the invention.

FIG. 14 is a flow chart describing a rating system, under an embodiment of the invention.

FIG. 15 illustrates an exemplary structure for a database to maintain updated records on ratings for addresses containing media resources, under an embodiment of the invention.

FIG. 16 is a flow chart for creating play-lists using rating information, under an embodiment of the invention.

FIG. 17 is a flow chart for programmatically categorizing media files, under an embodiment of the invention.

FIG. 18 is a flow chart for creating personalized play-lists of streaming media files available in a network, under an embodiment of the invention.

FIG. 19 illustrates a distributed playback architecture, under an embodiment of the invention.

FIG. 20 illustrates a block diagram of a messaging application, under an embodiment of the invention.

FIG. 21 illustrates a user-interface for use with a media search and playback system, under an embodiment of the invention.

FIG. 22 includes another user-interface displaying an instance of the web browser while media is being played back, under an embodiment of the invention.

## DETAILED DESCRIPTION

A. System Overview

According to an embodiment, a system is provided comprising a media search engine. The media search engine may be used to create a database of links to media files. The links may be structured according to predefined categories and/or user-defined search criteria. A client terminal includes a media player to automatically access one or more media files using the corresponding links. The media player then plays back media contained on the media files.

Among other advantages of the invention, the user terminal accesses media files at various sites on a network, without requiring users to manually select media links. For example, user-terminals may output music to a user by automatically accessing one or more Internet sites containing media files. The music is outputted without requiring users' to view and select links to sites containing the media.

In contrast to embodiments of the invention, using other systems to search for Internet files containing media can be a distracting and time-consuming experience for an end user. In many instances, such a search will yield a series of links on a directory or web search page. A user may have to click on each individual link, one at a time, to play each individual media file. The selected media file may be broken and unavailable to deliver media content. Even if the number of broken links is not high, the user must still click on the links one at a time to activate each media file, providing at best a stop-and-go experience.

In one embodiment of the invention, a user terminal is able to receive continuous media streaming from multiple sites on the Internet. Multiple sites may be accessible to enable the user terminal to receive streaming media without any interaction required from an end user other than signaling a request to receive streaming media. The user terminal automatically accesses media links containing media using a media playback component.

The media playback component may be controlled by one or more server-side modules. In one embodiment, the media playback component on the user terminal interacts with one or more play-lists generated by server side modules. The play-lists contain media links for the media playback application. The media links may be structured or ordered in the play-lists. The play-lists may be generated automatically by back-end modules and/or manually by editors. The play-lists may also be generated by end users.

The media playback component may also interact with one or more server side search modules to access media links on the network. The media links may be automatically selected based on, for example, a search criteria from the end user.

Embodiments of the invention provide a system to search and playback media accessible over a network. In one embodiment, a media search engine is provided to enable users to request media output based on a criteria set forth in a search request. The media search engine is able to efficiently locate streaming media on the network that matches criteria set forth in a search request. The system provides continuous playback of media found on multiple sites of the network. For example, a user may specify a search based on a specified artist. The system locates one or more sites on the Internet containing media files from the specified artist. The system enables the user terminal to automatically and continuously play back media creations available on the Internet sites.

Further, a backend system under an embodiment of the invention minimizes possibilities of broken links and mismatched search results. The backend system may also be used to perform manual and/or programmatic quality check of the media associated with each link.

Further, a search engine under an embodiment of the invention employs an Internet web browser software component on the back-end to perform searches and indexing of web resources. The Internet web browser component may be a configured or modified commercially available web browser component. Server-side modules may combine to control the browser in locating media links and media sites containing media content. As a result, the media search engine under this embodiment is efficiently implemented, using existing resources on the back-end system.

Among other advantages, embodiments of the invention enable streaming media from multiple media links to be automatically played to users. Embodiments of the invention also employ a scalable and distributed architecture. Scalability in this sense means that the service is available to a large (thousands or more) audience of simultaneous listeners or viewers while minimizing bottlenecks caused by congestion. Another advantage of a distributed architecture is that the unavailability of one media site, or of one or more media on the media site, does not preclude the user terminal from receiving media from another site. As a result, users are ensured a continuous listening or viewing experience.

Further, streaming media may be continuously outputted to users from multiple sites on the Internet based on personalized criteria set forth by users. The criteria may be set forth in one or more requests by an end user. The end user may experience media continuously outputted from multiple sites, based on only one request from the end user. This allows a user to request media through actions such as clicking requests through a user-interface.

An embodiment of the invention enables users to share streaming media experiences with other end users. For example, users may share play-lists containing links to multiple Internet sites. This enables individuals to create media programs of streaming media using multiple sites on the Internet. For example, play-lists may be shared among end users using a host web site, or e-mails.

B. Search and Playback System

A user terminal may transmit a search request from an end user to one or more modules on a server. A client side playback module, one or more server-side modules, or a combination of client and server side modules combine to access the user terminal to a site on the Internet that contains media content immediately available for loading and playback. The response to the search request is media output through the user terminal. The media content is outputted from the user terminal without any additional action on the part of the end user after the initial search request. Once media from one site is completed, the playback module automatically enables the user terminal to access and

playback media located on another Internet site. As a result, an embodiment enables the user terminal to output continuous streaming media to an end user, where the media outputted is accessed from multiple Internet sites.

Embodiments of the invention may be implemented on the Internet. Other embodiments may be implemented on any network that carries digital information, such as local-area networks (LANs), Wide Area Networks (WAN), Extranets, Intranets, Internet, and wireless networks, or networks utilizing wireless transmissions. An example of a network for use with an embodiment of the invention includes a network operating under a transmission control protocol/Internet protocol (TCP/IP). Embodiments of the invention may also be employed on proprietary WANs, such as America Online™. Thus, discussion of embodiments employed on the Internet are exemplary, and equally applicable to other types of networks described above.

A system for use with an embodiment includes a network enabled device, a network server module and a database. The network enabled device includes a device having components to couple to a network such as the Internet. The network enabled device includes a communication port and processor, and may also include memory and a display. The communication port may be a physical port, such as a connector extending a modem connection. The communication port may also be a wireless port, such as those configured to transmit and receive radio frequency data communications. Examples of network enabled devices include personal computers, handheld devices such as those operating Windows CE™ or Palm™ operating systems, and cellular phones with Internet capabilities such as Sprint PCS™ systems. Other examples of network enabled devices include smart appliances, such as systems including speakers and a processor to receive communications from the network.

The network enabled device may include a media playback component. The media playback component includes an application that plays back streaming media files. Examples of commercially available media playback components include Real Network Player™, Apple Quicktime Player™, and Microsoft Windows Media Player™.

In an embodiment, network server module includes server-side modules that communicate to the network enabled device through the communication port. The network modules may be coupleable to the network enabled device through a network such as the Internet. Alternatively, the network server module may exist on the terminal. The network server module may, for example, access a database on the network from the terminal. Still further, the network server module may exist on both the terminal and on a server on the network. Specifically, the network server module may comprise network-side code, executed on the terminal through a client application. For example, the network server module may includes applets or Java script delivered to the user terminal for execution of processes and functions, as disclosed herein.

The database stores a plurality of addresses. Each address locates a media network resource. The media network resource includes files that can be loaded into the media playback component to output media. As used herein, media refers to a combination of audio and/or video. Video media may include a collection of images assembled together in an animated fashion to resemble motion or action. Examples of video media include movie clips, recordings from video recorders, and animation such as cartoons. Still further, media may include a collection of still images and graphic presentations that are combined with audio media. Other examples of media include dynamic or animated pictures or text on a web page.

In one implementation, the media files may be loaded and played back to output music or music videos. As another example, media files may include video or animation with story-lines, plots, characters and resemble conventional television or radio programming. Other examples include movie clips, home movies, movie trailers, or highlights from sporting events.

As used herein, a module includes a program, a subroutine, a portion of a program, a software component or a hardware component capable of performing a stated task or function. A module can exist on a hardware component such as a server independently of other modules, or a module can exist with other modules on the same server or client terminal, or within the same program.

The network server module is coupleable to the network enabled device to exchange communications, and to access the database. The network enabled device provides a search request, including a search criteria. The search criteria includes any condition specified by the user to identify some of media files from other media files in the database. Examples of search criterias include titles, artist names, data types, user preferential ratings, quality, and duration.

The network server module selects at least one address from the database based on the search criteria. The identified addresses are signaled to the network enabled device. The network server module may communicate with the media playback component to cause the media playback component to playback the media resource located by the address.

FIG. 1 illustrates a process for use with a system to search for and playback Internet streaming media, under an embodiment of the invention. In one application, the process is performed on architectures described and illustrated with FIGS. 2 and 3. While the process is described with reference to an integral system, one or more steps described with FIG. 1 may be performed independently of other steps. Similarly, components and modules used to perform steps in FIG. 1 may also be implemented in different systems and architectures. Further, steps mentioned with FIG. 1 may be performed concurrently with one other, or in an order different than shown in FIG. 1.

In step 110, a system builds a database of addresses. An address may include a Universal Resource Locations (URL) for network and Internet sites. A media site include, for example, a web site that allows web users to access streaming media. In other embodiments, the media site may locate network media resources on other types of networks. The media sites may be located through a media search engine, as described elsewhere in this application. An exemplary process for identifying media sites under an embodiment of the invention is provided with FIG. 4.

Each media site may provide access to media through one or more media links available at the site or through other means. The media links identify web resources having media content. These web resources may include a file of arbitrary type. Examples of file types include Multipurpose Internet Mail Extension (MIME) types such as MOV, JPEG, or RAM. The file is

available for loading, browsing or playback on the World Wide web. Each media link may be either an internal or external link relatively to that particular media sites. An internal media link on a web-site may correspond to a URL that identifies a web resource located on the web domain, host, property or server of that site. An external media link on a media site identifies a web resource that is not located on web domain, host, property or server of that media site.

In step 120, the system identifies and stores in a database media links (URLs) for each media site. An exemplary process for identifying and storing media links on individual media site stored in a database of media site is provided with FIG. 5.

In step 130, each media link is verified. The media link is verified to contain media that is available for playback for users. Thus, broken links, inoperational or unavailable media are precluded from being verified.

In step 140, metadata information is extracted from each media link. Preferably, metadata information is extracted from each verified media link. In an embodiment, metadata may also be added to a list or database of extracted metadata. Additional metadata may be added using, for example, manual interactive editing and an editor interface (see for example, editor interface module 275 in FIG. 2). Examples of metadata information include (with an exemplary data structure type associated with each media link in parenthetical): identification (Integer), author (String), duration (String), media URL (URL), source web site (URL), media type (Integer), rating (Real number), number of votes (Integer), verification status (Boolean), edited status (Boolean), genre type (Index into a genre database table), play-list genre status (Boolean), mix (index into mixes database table), play-list mix status (Boolean), mood (index into moods database table), description (String), clip broadcast quality (integer), image size for videos (integer, integer), and play-list mood status (Boolean). One or more of these types of metadata may be extracted from the media links or from the actual media file. For example, a media link to a web resource may be extracted for identification, duration, author, and source web site. Similarly, one or more of these types of metadata may be added to the extracted metadata information. For example, genre type and description information may be added to the extracted metadata information.

In step 150, the system creates media play-lists using media database for predefined categories. In an embodiment, verified media links are structured into play-lists, such as described with FIG. 10.

In some embodiments, links to streaming media commercials may be inserted into the play-lists in various locations between media clips. These commercials are targeted to the audience likely to listen to the media available on the play-list. The commercial may be produced and broadcast from distributed sources, or from web server module. Other examples of streaming media that can be included with play-lists includes news items and weather reports.

In step 160, a playback interface is provided. The playback interface causes the media player component on the user terminal to play media associated with media links in each play-list. The playback interface may include features to manipulate play-lists, or to switch between play-lists. For example, the playback interface may allow for a user to skip media or web resources until a preferred media or web resource is located. The playback interface is a software or hardware application that is executed on the user terminal. The playback interface may be packaged as a web application, dynamically accessible through a web server module, or be packaged as a desktop software application.

In an embodiment, a playback interface module includes a streaming media clips rating system that allows users to rate each clip as it is played back. The back-end module rating system uses these votes to generate rated play-lists that are available through the playback Interface for playback.

Further, the playback interface module may include a system to allow users to send Internet e-mail notifications to one or more e-mail addressees regarding a media clip, or to send continuous streaming media programs containing multiple media clips from multiple network sources. Recipients may initiate the playback module by selecting one or more links contained in the e-mail. Selecting a link from the e-mail initiates the play back module on that recipient's terminal, causing the play back module to play back the media clip or the programming referred to by the sender.

The playback interface includes user interface elements that allow users to define and execute search criteria for media playback.

FIG. 2 is a block diagram illustrating an architecture of a system 200, under an embodiment of the invention. The system is shown to link a user terminal 210 with media that is accessible on the Internet 220, including the World Wide web 215. Other embodiments of the invention may operate with different types of networks.

The user terminal 210 includes any network enabled multimedia computing platform. In particular, user terminal 210 includes any Internet enabled multimedia computing platform. Examples of computing systems for user terminal 210 include personal computers (PC), personal digital assistants (PDA), smart phones, and Internet enabled televisions and radios, and other devices. The multimedia capability is manifested in the availability of a steaming multimedia playback software and or hardware component. Internet enabling means that the platform can access information over the Internet. In an embodiment, user terminal 210 runs the media location and playback interface module 270 that is accessible over the Internet. A communication channel 212, such as a phone line, wireless medium, or DSL line, is used to couple the user terminal 210 to the Internet. Alternatively, the playback module may be preinstalled on the client terminal. Under both configurations the playback module access media play-lists that are stored on an Internet web server.

A back-end database management system 245 is provided to maintain information used in providing media searching and playback to user terminal 210. The database management system 245 receives information from modules, including server-side modules that communicate with user terminal 210. In an embodiment, modules used to provide media search and playback capabilities to user terminal 210 include a media search module 230, an automatic verification and extraction module 255, an editor module 250, a play-list generator module 260, and a web server module 270. The modules may communicate with an interface of user terminal 210.

Under an embodiment, this communication is implemented using media play-lists on the web server module 270.

The modules may also communicate with software applications or components on the user terminal, such as a web browser application or a Streaming Media player component in a manner that will be described below.

In an embodiment, media search module 230 includes a media directories meta-crawler module 234 and a media search engine 238. The meta-crawler module 234 and the media search engine 238 may be operated independently and concurrently of one another. The meta-crawler module 234 conducts a general search of the Internet 220 to locate media sites. Media sites may include web pages that are likely to contain web resources, media links to web resources, or links to other web pages that have such media links and/or web resources. The meta-crawler module 234 adds the address or location of each found media site to a media site table 243 maintained by database management system 245. The media site table 243 may list media sites that identify a URL for each web page located by meta-crawler 234.

In one embodiment, the entire media site table 243 is programmatically generated by meta-crawler module 234, without any manual or interactive human input. In other embodiments, an editor module 232 may interface with database management system 245 to manually input a URL for one or more of the media sites into the media site table 243. Another embodiment may substitute editor module 232 for meta-crawler 234, so that the media subdirectory manually receives a URL for each media site.

The media search engine 238 accesses the media site table 243 maintained by database management system 245. The media search engine 238 identifies media links to web resources on each media site provided in the media site table 243. In an embodiment, media search engine 238 contacts each site in the media site table 243 to locate media links. The media search engine 238 then stores the addresses of each media link in the database management system 245. In an embodiment, a URL of each media link is stored in a portion of a media and metadata table 247.

An automatic media verification and metadata extraction (AMVME) module 240 accesses the portion of media and metadata table 247 that contains URLs to the media or media links. The AMVME module 240 verifies each media link in media and metadata table 247. The media links are verified to

contain web resources matching a criteria defining media. For example, each media link may be verified to contain a combination of audio or video, rather than be only a text document. In addition, the media links are verified as available for playback by users, to avoid broken or old links being maintained by database management system 245.

The AMVME module 240 also extracts metadata from the web resource associated with each media link in the media and metadata table 247. Preferably, AMVME module 240 extracts metadata from verified media links. The AMVME module 240 may automatically visit each media link on the Internet to extract metadata information, as well as verification information. The metadata extracted pertains to information available from the web resource or about the web resource on the media link. Examples of metadata that may be extracted by media extraction module 255 include information such as the author, duration, name, description text, broadcasting and playback quality of the media content and frame size and display resolution for images, video and home movie clips. For example, a media link may be associated with a web resource that is an audio media. Metadata that may be extracted from the media creation may include the artist name, the name of the media creation, length and audio/video quality. In an embodiment, media extraction module 255 also verifies that the media is available for playback from the media site. The AMVME module 240 may accesses database management system 245 to store verification and metadata information in media and metadata table 247.

In an embodiment, a metadata editor interface 275 is included in the system 200. The metadata interface 275 accepts manual entry from an editor pertaining to metadata of the web resource associated with each media link. The metadata interface module 275 may access one or more media links in the media and metadata table 247 to allow manual inspection of each web resource for metadata information. An editor operating metadata interface module 275 transmits a media streaming request to have the media of the web resource replayed for inspection on a terminal. The metadata editor interface 275 then allows for additional metadata to be stored in media and metadata table 247. Preferably, the additional metadata information includes metadata that is not programmatically available from the media link containing the web resource.

For example, metadata editor interface 275 may be used to add information to media and metadata table 247 information such as genre of the web resource, description of the web resource, and system predefined information, such as mood and mix, that are found applicable by the editor to the web resource.

A play-list generator module 260 generates a plurality of play-lists based on information in the database management system 245. In an embodiment, play-list generator 260 accesses media and metadata list 247 for URLs to media contained on stored media links. The play-list generator module 260 may create play-lists 284 from predefined categories characterized by information stored in the database system for media links and metadata stored in table 247. Play-lists 284 are stored on web server module 270.

Under one embodiment, the web server module 270 includes a media location and playback application. The user terminal 210 interfaces with the media location and playback application through the Internet. For example, web server module 270 makes the media location and playback application available on a web site. The user can launch the media location and playback application by clicking a link on the web site. Under another embodiment, the playback application is pre-installed on the user terminal.

The playback application accesses the web server module 270 to load media play-lists that are stored on it. In an embodiment, the playback application reads Media URLs and Metadata stored in one or more play-lists. This information is used to playback continuous media from the play-lists to the user. A web page or network site hosting the media file being played back may also be displayed as an instance of a web browser on the network enabled device. For example, audio media may be played back while the user is presented with a web page hosting the audio playback (see FIG. 22 and accompanying disclosure).

The media location and playback application may output or playback media processed by the back-end system and stored in the media and metadata table 247 upon receiving a request from user terminal 210. For example, under an embodiment, music may be outputted from user terminal 210 continuously in a manner that resembles a jukebox, Disk Jockey Mix or a radio station.

An interface of the user terminal 210 enables users to skip playback of media clips, or to switch categories. For example, a user on user terminal 210 may select to hear Jazz programming, and then switch to a genre of classical music. One or more features of a user-interface may be used to enable users to make selections (see FIG. 21 and accompanying text). The user may also control playback settings such as volume, pause, seek and retrieve additional media clip information, skip songs, or replay certain songs being automatically played. The user may also control and/or customize the creation of play-lists using the interface. For example, one musical play-list may include a combination of genres, such jazz and classical songs.

In an embodiment, the media location and playback application programmatically controls a streaming media multimedia software or hardware component to perform the actual streaming of the media digital bits to the user terminal's multimedia output device (such as video display and speakers hardware) . The media location and playback application contains functionality that responds to software events generated by the streaming media component. For example, a playback error generated by the streaming component may result in the application instructing the component to play another media file. In another example, the application determines and initiates playback of a media clip in response to the component reporting that the currently playing media has finished. The application may contain user interface elements that allow users to issue media playback commands. These commands are dispatched by the application to the component that implements the playback command for the currently played media.

In an embodiment, the media location and playback application works in combination with functional commands provided to the user via a web based software application. A user-interface may be provided to enable the user to select the function commands at the software application. An example of a user-interface is provided below, with FIG. 21 and accompanying text.

In an embodiment, a categorization module 290 accesses media and metadata table 247 to add metadata and to categorize media associated with media links in media and metadata table 247. The automatic process generates metadata such as music genre by consulting with information stored in other

records in media and metadata table 247. For example, the module can automatically set the genre metadata information for all media creations available in the table, for a given artists, according to genre metadata entered for one or more media creations by the same artists. This process greatly contributes the efficiency and scalability of the back-end system.

FIG. 3 is high-level system software components diagram for the system 300, under an embodiment of the invention. The diagram shows how software components may be written, deployed and interact to provide the functionality described by system 200. The components of system 200 may be described as a three-tier architecture. Components are written to spec and deployed to a backend tier, a middle tier, and a front tier. The backend tier includes the database management system 245. The database management system 245 includes a database 345 and a backend interface module 355. The backend interface module 355 may be provided with, for example, a Microsoft SQL Server system (MS SQL).

The middle tier includes modules that communicate with backend interface module 355. The middle tier may include a media sites manager 360 and a media manager 365 software components. The media sites manager 360 and the media manager 365 each independently communicate with backend interface module 355. The media sites manager 360 components exposes a programmatic interface 362 to communicate with modules and components in the front tier. The media manager 365 includes a first media manager interface 366 and a second media manager interface 368.

The front tier includes a media site module 330 and a media module 340. The media site module 330 communicates with site interface 362. The media site module 340 communicates with the first and second media manager interfaces 366 and 368. The first and second media manager interfaces 366 and 368 communicate with the media module 340. The media site module 330 includes a front-end interface 332 to a directory meta-crawler 310 and a media search engine 312 modules. The media site module 340 includes a front-end interface 342 to the media search engine 312, an editor interface module 314, and an automatic verification module 316. The directory meta-crawler 310 crawls Internet media directories web sites. The links to media web sites are

handed over to the MediaSite module 330 for storage in the database. The media search engine 312 searches for media links on web sites provided by the MediaSite module 330, these links are transferred through Interface 342 on the Media module 340 for storage in the database module 345.

The editor interface module 314 obtains media link for editing from the Media module 340, using Interface 342 and loads the media for editorial playback from the Internet. The editors provide metadata for media that are added to the database by the Media module 340.

The verification module 316 examines media files or web resources accessed through each media link and updates metadata regarding media availability in the database using Media module 340. This module also extracts metadata from Internet media and updates this in the database using Media module 340. The module queries the database for a batch of media records using the Media module 340 and automatically verifies and extracts metadata for the Internet media represented by these records.

With respect to communications from the backend tier to the front-end tier, database management system 345 of the backend tier provides records to the system 300. Each record or record set is disconnected from tables or databases of record(s). Disconnected records are transmitted from the backend tier to the front-end tier as active database objects (ADO) Disconnected record sets.

With respect to communications from the front-end tier to the backend tier, each disconnected record can be updated in the database by any components on any tier. Updated records are transmitted to the database management system 345 in the form of record set update operations. In an embodiment, directory meta-crawler 310 sends URLs to be added to records in database 345 to media site module 330 using an asynchronous method calls. The media search engine 312 transmits to media site module 330 using a get search method call for batch sites of URLs. The media search engine 312 uses an asynchronous method call to add media links and metadata associated with media links.

The components and all tiers expose programmatic interfaces that contain callable methods using the MS DCOM (distributed component object

model) software component technology. Communication between the tiers is also implemented using method calls on these components. The components are deployed in front, middle and back tier hardware systems. Alternatively, The components may be developed and deployed using the MS COM+ components technology. Using this technology, a COM+ In Memory Database system (IMDB) proxies and caches tables of the back-end database module 245. This process speeds up the search and editorial process. COM+ services such Queued Components may used to implement asynchronous method calls exposed on Interfaces 362 and 366.

C. Media Search Engine

Embodiments of the invention locate web resources on a network such as the Internet. In one embodiment, a network browser identifies a plurality of links to one or more network sites. The links are each selectable to open a network resource of a specified data type. The identified links are then made available to network enabled devices that can select one or more of the links.

As used herein, a network browser is software that performs core functions that include (i) loading network resources; (ii) parsing, translating and laying out network resources, and (iii) displaying the network resources. The network browser includes an application programmable interface (API). An embodiment of the invention employs the network browser on a back end to locate the network resources of the specified data type. One advantage of this embodiment is that the web browser is employed on the back end programmatically, rather than through manual interaction with an editor or other user.

A network browser may include a shell, an API, and a processing module. A component of the network browser includes the API and the processing module. For Internet applications, the processing module may include, for example, a MSHTM or DLL module. The network browser component performs functions that include loading a network resource, as well as parsing, translating, and laying out the network resource.

In an Internet application, a web browser component may be used to locate resources of a specified data type. The web browser component may be a

portion of a commercially available browser. For example, the web browser component for use with an embodiment of the invention may be a reconfigured Netscape Navigator™ or Internet Explorer™ browser.

In an embodiment, the web browser component is programmatically controlled through the API of the web browser to access the web resource for the plurality of links. The web browser may be programmatically controlled to bypass the shell of the web browser. For example, the API may be used to instruct the web browser to ignore the shell, or to detach the functionality of the shell. The remaining web browser component then identifies the links to the specified data types. The result is that the web browser component accesses the web resources of the plurality of links to identify the data types of the resources on the links while ignoring data such as images and sound.

In another embodiment, a search module controls the web browser component to access a web site. The search module controls the web browser component to identify a plurality of links to media web resources at the web site. Each of the plurality of links identified by the web browser component are selectable to open a media web resource. The search module stores the plurality of links in the database.

In another embodiment, a database includes a plurality of links to media web resources. The plurality of links are programmatically verified to determine whether each link opens a corresponding media web resource. The verified link are made available to a plurality of Internet enabled devices that select one or more of the links to open the corresponding media web resource.

The links may be verified on the back end using a media player, including a commercially available media player. For example, each link that needs to be verified may be programmatically loaded through an API of the media player. The response provided by the media player to the link determines whether the links are verified.

In another embodiment, the media player may be programmed to identify metadata from the media web resource of each link. The metadata may then be stored in a database associated with the link.

Among other advantages, embodiments enable network links to files of a particular data type to be rapidly accumulated and stored in a database. Each

of the links are selectable to open a file on the network. The files may enable a terminal to play back media. In an embodiment, the addresses access media files that can be loaded into the media playback component of the user terminal. The files can be stored in the database with information that characterizes the files associated with the links. Thus, the links may be characterized by, for example, metadata information, and one or more classes of information.

In addition, embodiments enable each link in the database to be programmatically verified, so that there are no broken or unavailable links in the database. Still further, some metadata information may be programmatically identified from each media file. In contrast, existing systems verify links manually, employing interactive users to perform the manual functions. Existing systems also extract metadata information manually.

FIG. 4 illustrates a block diagram in which system 200 receives a search request 203 and provides a response 209. In an embodiment, system 200 processes the search request 203 using the web server module 270 and the media and metadata database 247. The end terminal 210 signals the search request 203 to web server module 270. The web server module 270 accesses the media and metadata database 247 to retrieve one or more URLs matching the search request. The web server module 270 signals the response containing the retrieved URLs to the media playback component 211 of end terminal 210.

In an embodiment, the search request 203 includes one or more criterias that specify a selection of URLs from media and metadata database 247. The criterias may correspond to parameters in media and metadata database 247. The table 249 illustrates a data structure of media and metadata database 247. The table 249 includes a URL list comprising a plurality of URLs. Each URL provides direct access to a web resource containing media. Each URL is characterized by one or more parameters that correspond to metadata information about the web resource associated with the URL. As an example, table 249 provides parameters as being genre (G), data type (DT), category (C), web resource identity, and one or more play-lists (PLAY1, PLAY2, PLAY3).

The genre data is a broad class identifier of the media creation comprising the web resource of the respective URL. For music, the genre may include rock, classical, and jazz. For movies, the genre may correspond to

romance, comedy, horror etc. The genre may be identified either programmatically, or through an editor interface. One genre may be associated with one or more URLs in table 249. In the example provided, URL1-URL7 are in either one of three genres, G1, G2, and G3. Alternatively, several genres may be associated with one URL.

The data type parameter corresponds to the MIME characteristic of the web resource associated with the URL. The category parameter may correspond to a sub-class of a genre. For example, in music, a category may correspond to soft rock. In movies, a category may correspond to the time-period of the movie. The table 249 illustrates an example in which the category is unique to the genre. Thus, a web resource of one genre is not in the same category as a web resource of another genre. As an example, URL1 and URL3 are in the same category, as are URL2 and URL5. However, no other URLs are in the same category.

Other metadata information that may be included in media and metadata database 247 include identifier information. The identifier information identifies the web-resource. The identifier may provide name of a specific media creation, as well as an artist or author of the media creation.

In an embodiment, media and metadata database 247 includes play-list information as parameters of metadata information. The play-lists may be identified in any one of several ways. For example, the play-lists may be identified by a unique name or other identifier. The play-lists may be identified by another parameters, such as genre or category type. A Boolean data type may be associated between each URL and each play-lists.

The criterias of the search request 203 specify one or more parameters to media and metadata database 247. For example, search request 203 may include criterias corresponding to one or more of a genre, category, play-list, or identifier. In an embodiment, web server module 270 accesses media and metadata database 247 for URLs that have all of the parameters set forth in the search criteria.

The web server module 270 retrieves the URLs matching the criterias of the search request. The response 209 is signaled to the media play-back component 211. The response includes one or more URLs. It is noted that

when play-lists are requested, additional URLs multiple play-lists are provided. The response 209 may also include metadata information. For example, the response 209 may signal to end terminal 210 the duration of the web resource for each URL, the artist, the history, etc.

The web server module 270 further signals control information 207 to access the URL provided in the response 209. The control information 207 causes end terminal 210 to load the web resource for the media playback component 211. Thus, the media playback component automatically loads the web resources associated with each URL included in response 209. The experience provided to end user 210 is that media is outputted in response to inputting a search request. This is in contrast to other systems in which the user is provided links to media sites containing web resources matching the search criteria.

As an example, a user may specify a media creation from a specific category. For example, the user may input a search request for "nature sounds". The web server module 210 accesses media and metadata database 247 for parameters that match "nature sounds". In one application, a play-list is located that is pre-programmed to provide URLs to web resources containing nature sounds. The response 209 then comprises one or more play-lists, each containing multiple URLs to web resources containing nature sounds. In another application, a category parameter or sub-parameter is searched for "nature sounds". The response 209 may include one or more URLs that are not pre-programmed into play-lists. The response 209 may provide URLs to media playback component 211 one at a time, in groups (such as in play-lists), or all at once.

In an embodiment, categorization module 280 may be used to programmatically create one or more parameters such as illustrated by table 249. The parameters may be determined, by for example, identifying metadata information on the media site hosting the URL.

FIG. 5 is a block diagram illustrating the media playback component 211 being controlled by one or more modules of system 200, under an embodiment of the invention. The web server module 270 signals control information to an application program interface 276 of the media playback

component 211. The control information may be provided by the media locator and playback application of the web server module 270. The web server module 270 signals commands, with one or more URLs corresponding to media resources selected to be signaled to the user terminal 210. As an example, commands from web server module 270 may be instructions that use each URL as an arguments. Examples of commands that control the media playback component include play(URL) and pause (URL).

As an optional feature, web server module 270 may also signal control information to a web browser component 213 of user terminal 210. The control information may be in the form of commands to access and display a web site associated with the media resource. The commands may be provided to an application program interface 279 of the web browser component 213. This allows the system 200 to display the web site associated with the media resource selected to be played back on user terminal 210. Thus, user terminal 210 may play back media from the media resource while displaying the web site where the media resource is located. One advantage of this embodiment is that it allows users to receive media playback from the media resource in one medium, such as audio, while providing images, audio text, or media not associated with the media resource. Thus, users can listen to songs from media resources signaled to user terminal 210, while viewing banner ads on the web site where the media resource is located.

Each URL signaled from web server module 270 has a network protocol. For media resources, and specifically audio files, types of protocols include "HTTP" protocol, "PNM" protocol (RealNetworks, having .RM extensions), or "RTSP" protocol (having .RAM extensions). The URLs signaled by web server module 270 include the protocol at an initial portion of the string forming the URL. Preferably, for HTTP protocol files, the string portion corresponding to "HTTP" is replaced with "PNM". This adjustment prevents playback component 211 from failing as a result of a bug in the media playback component, particularly if the playback component 211 is a RealNetworks Player™.

The web server module 270 may be either a network-side module, client side module, or a combination of both. In either embodiment, web server module 270 may access the database directly or indirectly.

FIG. 6 illustrates a process for a component of an Internet media search module, under an embodiment of the invention. A process such as described with FIG. 6 may be used to build a database of media sites, where each media site includes media links and/or links to other media sites. In an embodiment, the process of FIG. 6 is applicable to meta-crawler module 234 in system 200 (FIG. 2).

The process of FIG. 6 is a backend operation that is unobservable to a user of the user terminal. Preferably, the flow process of FIG. 6 is an automatic or programmatically controlled process, conducted periodically. For example, media links may be identified and stored under a flow process such as shown by FIG. 6 every few days or weeks. The duration between executions of the flow process of FIG. 6 maybe referred to as an idle period.

The process of FIG. 6 provides for extracting URLs of media sites from a web pages directory. Examples of a web directory for use with an embodiment of the invention includes directories on web sites such as Yahoo.com® and Lycos.com®. The flow process of FIG. 6 is a backend operation that is unobservable to a user of user terminal 210. Preferably, the flow process of FIG. 6 is an automatic or programmatically controlled process that does not require human interaction.

In step 410, a directory home page is added to a searched-pages data structure. The searched-pages data structure maintains. A similarly structured parsed-pages data structure is also maintained to hold URL of pages already processed by the module. The parsed-pages data structure indicates whether a home page web directory was previously parsed by the process. The searched-pages and parsed- pages data structures are keyed or indexed by URL and they support querying for existence of a given URL in them. Examples of keyed or indexed data structures include database tables and hashtables.

In step 410, the parsed-pages data structure is empty, indicating that the directory home pages in the searched-page data structure have not been parsed.

In step 420, a determination is made as to whether the searched-pages data structure is empty. If the determination is affirmative, the flow process is done. This occurs when the process has parsed all the Internal web pages in the directory. If the determination is negative, a current page link is called from the searched-pages data structure in step 430. The current page is then loaded into memory and parsed. Parsing means loading and reading the HTML source (or equivalent) code of the web page so its content is accessible and in a machine-readable format.

In an embodiment, the page is parsed using an HTML parser component. An example of an HTML parser is a web browser. Thus, the current page may be parsed using a web Browser component. Specifically, step 440 of the process may be implemented using an application program interface (API) that is exposed by the web Browser component. In this context, the web Browser component is configured and used in a back-end server process with no visible presentation area or end user. It is configured not to load or render media at the web page so that the loading is more efficient. The configuration may occur through the API.

In an embodiment, the web browser is configured to parse web pages efficiently by, for example, automatically excluding a presentation layer from being displayed. Further, the web browser may be programmatically configured to not load or parse information that is not critical to the search function. For example, the web browser component can be configured to not load media data found on web pages.

In step 440, all links to media sites on the currently parsed-page are determined using the parser. The HTML parser API allows access to the page document object model. In step 450, all new external page links are added to the media sites database. An example of a web-page data structure is provided with media site database table 243 (FIG. 2). The database stores the URL of the media sites and not the sites themselves. New external page links implies media sites that are not already indexed or present in the media site database.

In step 460, all URLs also link to internal links found on the currently parsed page are added to the web pages data structure, provided that the URL in question is (i) not already existing in the searched pages data structure and (ii)

not already existing in the parsed pages data structure. In step 470, the currently parsed page is moved to the parsed pages data structure, and the flow process returns to step 420. This process adds the URL of all the media sites indexed by the directory to the media sites database.

FIG. 7 illustrates another component of an Internet media search module, under an embodiment of the invention. A process such as described with FIG. 7 may be used to identify and store media links to web resources that are accessible from one or more web site. The process of FIG. 7 may be used in conjunction with a process such as described with FIG. 4. In an embodiment, the process of FIG. 7 is applicable to media search engine 238 in system 200 (FIG. 2).

In an embodiment, the flow process of FIG. 7 is a backend operation that is unobservable to a user of the user terminal. Preferably, the flow process of FIG. 7 is an automatic or programmatically controlled process, conducted periodically. For example, media links may be identified and stored under a flow process such as shown by FIG. 7 every few days or weeks. The duration between executions of the flow process of FIG. 7 maybe referred to as an idle period.

The flow process of FIG. 7 assumes access to a media sites database store. The database includes URLs to each media site. An exemplary database of media sites includes media sites and metadata table 243, described with FIG. 2. Each record contains a URL field for media site and a field indicating the last date, if any that the process described in FIG. 5 lastly processed the web site at the URL in the URL field. Reference to a media site that is parsed implies that the media site was programmatically examined for media links to web resources, and for links to other media sites using a process such as the one described in FIG 5.

In step 510, MIME types are determined for web resources. Examples of MIME types that can be selected for step 510 include JPEG, MOV, RAM and WAVE.

In step 515, a record for a media site is fetched or received from the database. A condition of the media site received is that the media site was not parsed by the process described here during the idle period. This condition may

be specified by checking, for example, the date field associated with the record. For example, a date field may indicate when the media site was previously parsed.

A determination is made in step 520 as to whether a record and a URL was received in step 515. If no URL was received, the system interprets that all media sites in the database have already been parsed during the idle period. If a URL is received, the system in step 525 adds the URL of the media site to a URLs data structure of media sites to be processed. The URL data structure of unparsed media sites may be indexed or keyed. For example, the URL data structure may be a list, or a hashtable software data-structure.

In step 526, the last search field of the record fetched in step 515 is updated with the current date to indicate that the media site is parsed. In an embodiment, the field corresponds to a date in which the last parsing occurred.

In step 530, a URL in the date structure of unparsed media sites is fetched or received. If in step 535, a determination is made that the URL data structure is empty, the system returns to step 515. As will be further described, the flow process returns to step 515 only when step 570 is completed. If a determination is made that the URL data structure is not empty. Thus, steps 510-545 allow the flow process to distinguish between when a media site is being parsed for the first time, or has been previously parsed by the process during the idle period.

In step 545, media links on the media site fetched in step 530 are extracted from the HTML code of the page fetched in step 530. The media links are associated with web resources on that media site. In step 545, the media resources may be in any MIME format recognizable as media. In an embodiment, the currently parsed page is parsed using an HTML parser. An example of an HTML parser is a web browser. Thus, the media links may be extracted using a web browser. Specifically, the media links may be extracted using an application program interface (API) provided by a web browser software or hardware component. The web browser may be configured to perform this task efficiently by, for example, excluding a presentation layer. Further, the web browser may be programmatically configured to not load or parse information that is not critical to the search function. For example, the

browser component may be configured to not load media data found on web pages.

In step 550, new media links on each media site that match the MIME format specified in step 510 are added to a database. New media links refers to media links that do not already existing in the database from, for example, a previous execution of the flow process. In step 555, metadata is extracted from each new media link found in step 550. The metadata may also be stored in the database, with a reference to the URL the media that the metadata refers to. An exemplary database is provided with media and metadata table 247 (FIG. 2). An example of metadata is the URL of the web Page that provided a link for each media URL.

In step 560, the URLs of all new internal media site links on the media site currently being parsed are added to the URL data structure. New internal media site links refers to URLs of media sites that do not already exit in the URL data structure and that are not in the parsed URL data structure.

In step 570, the currently parsed page is removed from the URL data structure and added to the parsed URL data structure. The flow process returns to step 530.

D. Verification and Extraction Flow Processes

FIG. 8 illustrates a flow process that verifies and extracts metadata from Internet streaming media files. While media links are specified, other embodiments of the invention may employ the flow process of FIG. 8 within a system that incorporates verification and extraction of any content or resource associated with links stored in a database. A specific application employs a process such as described with FIG. 4 in the system 200. In the system 200, flow process of FIG. 8 may be performed by the AMVME module 240.

In step 610, a module operating the flow process of FIG. 8 fetches or receives an unverified URL from a database. An example of such a database is provided by media and metadata table 247 (FIG. 2). The unverified URL corresponds to a media link on a media site stored in a database such as the media site database 243 (FIG. 2).

In step 620, a determination is made as to whether a URL for a media link is present. If the URL to the media link is not present, the module assumes all media links have been determined as being verified, and the process is done.

If a URL exists, the module in step 630 loads the URL into an Internet multimedia playback software component and programmatically control the component to provide metadata embedded in the media file. In response to this request, the component loads some or the entire file over the Internet and provides the process with this information. In step 640, a determination is made as to whether the media or web resource associated with the URL was successfully loaded over the Internet by the module. If the determination is that media was not loaded, then in step 650 the URL associated with the media link is marked as unavailable and verified. The media is marked as verified to prevent the process from revisiting it once it already extracted metadata for it and verified it. The availability mark assists the flow processes described in FIG. 9 and FIG. 10. The determination may be in the negative if, for example, the media link is old and no longer contains a media file that is available for playback through its URL, or if the media link contains content other than what is designated as media.

In an embodiment, the process may use an availability rating for each media. Under such schema, each media is assumed to have the maximum availability score. For media that are currently not available for playback, step 650 may lower the score by one. The system may consider the media as unavailable if its score is below a predefined threshold. This process is useful since Internet streaming media availability may vary according to factors such as web server load and the time of day or year.

If the media is loaded, then in step 660 the media metadata is extracted from the playback component. Examples of metadata that can be extracted in this step include-artist name, playback duration, playback quality, frame size etc.

In step 670, extracted metadata is stored in a database with the associated URL of the media link that was presently verified. In step 680, the URL of the media link presently verified is marked as verified in the database. The flow process then returns to step 610.

FIG. 9 illustrates a process for interactively adding metadata to URLs of media stored in a database. In an embodiment, the database may correspond to verified URLs of media links determined in FIG. 8. For example, a process such as shown by FIG. 9 may be performed on information stored by AMVME module 240 in media and metadata table 243. The process of FIG. 9 may be performed by a module interface, such as editor interface 275 (FIG. 2).

In step 710, an unedited media record is fetched or received by an interface module from a database. The unedited record may be one or more categories of metadata and other information about a media link, media site, or web resource. In an embodiment, the unedited media information includes a URL to a media link, as well as metadata extracted programmatically, such as described with FIG. 8. In step 720, a determination is made as to whether a record was received. If no record is received in step 720, the flow process assumes there are no unedited records remaining in the database, and the process is done. If a record is received, the in step 730 the interface module is updated with the record received. This may correspond to displaying the record fields to the editor operating the editor interface.

In step 740, the web resource associated with the record received is loaded into an Internet multimedia playback software component. Preferably, the software component is programmatically constructed and controlled by the module interface. The software component plays back the media to the editor. The editor is able to experience the media played back from the web resource associated with the media link. The editor is able to determine metadata information regarding the web resource. For example, the editor may determine mood, genre, quality, appropriate mix name, and description of a web resource such as an audio media creation or a home movie clip. In an embodiment, the editor controls playback of media located by the search engine on the network side, such as by pausing and playing media back through an editor interface.

In step 745, a determination is made as to whether the record received also includes previously determined metadata. The previously determined metadata may be extracted programmatically in another process, such as described with FIG. 8. If the determination is made that the record received does not contain extracted metadata information, then in step 750 the editor

interface automatically extract metadata from the web resource associated with the URL of the record. To accomplish this step, the editor interface may access another module that automatically extracts certain types of metadata information. For example, the editor interface may forward the record to AMVME module 240 (FIG. 3) that performs a flow process such as shown by FIG. 8.

Once metadata is included with the record, then a determination is made in step 760 that the editor operating the interface module may choose to save the auto-extracted metadata already included with the record in the database. If the determination to step 760 is negative, then in step 765 the editor updates media information with editor provided metadata using input elements on the editorial software user interface. Once the determination in step 760 is positive, the record is marked as edited and updated in step 770. Then, all the newly added metadata for the media record is updated to the database. The process then continues from step 710 for the next unedited media. The media is marked as edited so it won't be included for editing in the process.

FIG. 10 illustrates a process for generating a play-list. The flow process of FIG. 10 assumes that play-lists names are predetermined and stored in a database. Each play-list is identifiable by its name. For example, classic music, jazz and rock. The play-lists include records of media links. In an embodiment, a record includes at least a URL to a streaming media that is categorized in a database as belonging to the play-list name. In step 810, a play-list name is received from the play-lists database. In step 820, a determination is made as to whether a play-list name was received. If the determination is negative, the system assumes it produced play-lists for all play-lists names, and the flow process is done. This process is routinely executed to add all newly added media to the appropriate play-lists.

In step 830, media records that match search criteria are fetched from the media database. The criteria is that each record play-list record field must match the current play list name obtained in step 810 and that the 'in-play-list' record field for the play list name has False value. In step 840, a play-list is generated to include all media stored at the records fetched is step 830. The new play-list contains one record entry for each fetched media record. Preferably,

each play list record includes media URL and metadata information that is obtained from the media database record.

In step 850, the media records called in step 840 are labeled as being in the "in- play-list" for the current play-list name. This is achieved by setting the "in-play-list" value for the media database record to true for the appropriate play-list name.

In step 860, the generated play-list is made available to a server-side module, such as web server module 270 (FIG. 2). As an example, the play-lists may be stored, copied or appended to be made available on the web server module. Once the play-lists are available on a server-side module, media URLs and metadata stored in the play-lists is made available to the user terminal so that the user terminal may customize media output available from the play-list. Specifically, one or more playback applications that run on the user terminal may read the play-lists, access media links on the play-lists, continually play-back streaming media from media URLs in the play-list and present media metadata to users for further interaction. The play-list may also be configured to provide access to a client-side media player component that uses a URL of a media link to load and play the media associated through it. Additionally, users may further modify and edit play-lists to create personalized media programming. Further, play-lists may be dynamically generated by a web application in response to a request for media playback made on the user terminal.

FIG. 11 is a flow process for software or hardware application that enables a user terminal to playback streaming media programming determined by play-lists. An embodiment described below assumes that play-lists are available for the process, and that play-lists are identifiable by play-list names. For example, the play-lists may be dynamically generated by the play-list module, in response to a search criteria signaled from a user terminal. The play-lists may also be manually generated by editors on the network side. The play-lists may be predetermined by, for example, a process described with FIG. 10. The playback component can access the play-list without any direct interaction with server side modules.

In an embodiment, the flow process employs a streaming media player component installed on the user terminal. The media player may be preexisting on the user terminal. Examples of media players for use with an embodiment include RealNetwork Player™, Microsoft Windows Media Player™, and Apple QuitkTime™. The application described in the process may be web based or installed on the user terminal.

In step 910, an application interface for a media player on the user terminal is provided.

In step 920, a default play-list name is selected from a list of play-lists. In an embodiment, a database of play-lists is stored on or accessible through the web server module 270. The play-list generator module creates and stores play-list on the web server module to provide the interface with the user terminal 210 and media player stored thereon. Each play-list may store two or more media links, and preferably a plurality of media links.

In step 930, one or more play-lists for the current play-list name are loaded. In step 940, media is presented and played-back on the user terminal. To playback media, server-side modules may provide the media player with URLs to media links that are stored in each play-list. Each play-list may include one or more media link URLs and media metadata. The user terminal then accesses the URL and loads the web resource associated with that media link into a streaming media playback component on the user terminal. Media playback on the user terminal includes outputting, for example, audio and/or video stored in digital format on web resources associated with a media link. In embodiments where the web resources include video media, the step described may dynamically adjust the interface size and the playback component that will handle the actual playback according to the media clip metadata.

Under an embodiment of the invention, the media playback component continuously plays back media by (i) accessing a first site on the network and playing back media from the first site, (ii) then automatically accessing a second site and playing back media from the second site. The media sites may be provided by play-lists which that are made accessible to the media playback component. The sequence for automatically and continuously playing back media may be repeated for each media link included in the play-list. The play-

lists may include hundreds of media links, thus allowing the media play back component to automatically and continuously play back media using numerous sites on a network. As a result, a user is able to experience continuous media play back for hours at a time.

The user terminal also includes an interactive interface to affect the media being played back. An end user on the user terminal may choose to manipulate media playback through one or more commands that may be inputted through the application interactive interface or presentation layer.

In step 945, a determination is made as to whether an event occurred. If an event occurred, the flow process determines the event. The flow process may determine the event that occurred sequentially or concurrently. Preferably, the flow process is configured to receive media playback event from the streaming media playback component. If the event is to skip the currently played media, then a determination in step 960 causes a corresponding action of the media being skipped, and the process step returning to step 940. If the process received a playback error event, or an playback error event, then a determination in step 965 causes the flow process to return to step 940 to playback media from the next web resource of the play-list or play-list name.

If a user quits the application, or signals to quit, then a determination in step 970 causes the flow process to be done. In step 975, a user may choose to view a new media web site while media is being played back on the user terminal. Then in step 980, the media web site is opened in a new Internet window, preferably using the client side web browser.

In step 982, a determination is made as to whether the action selected by the user on the user terminal is to send an e-mail message to one or more e-mail addresses that allow the receiver(s) to playback the current media and the current play-list played by the sender at the time of the event. A user may send either an e-mail containing the URL, the play-list, the play-list name or a URL link. When the message receiver clicks on the link, his terminal will execute the media playback application and will start playing back the media and the play-lists played at the time of the message-sending event. If the determination is positive, then in step 984 the user terminal prompts the user for an one or more e-mail addresses, and then prompts the user to transmit the e-mail. The user

need not have an e-mail client software application for the operation to succeed. The e-mail may be directed to terminals having a streaming media playback component and Internet access.

Preferably, the e-mail message is directed to a user having a user terminal that communicates with server-side modules so that the recipient user terminal is automatically plays back media from the transmitted media link received upon the e-mail being opened. Thus, server side modules may receive addresses from the terminal and act as the source of the email addressed to one or more recipients.

In step 986, a determination is made as to whether a user wishes to rate a media played back from the media links. If the determination is positive, then the user is prompted to rate the media in step 988. A rating value is transmitted to a backend web rating system application using the Internet. This operation is part of the service rating system that includes server side modules that produce, in combination with this operation, top and bottom rating media in each media category.

Step 990 illustrates other exemplary actions that may be received from a user on the user terminal interfacing with the playback application. For example, user actions may correspond to pausing media playback, adjusting volume, picture controls, size, seeking within the media, etc. In step 992, playback settings are changed according to user input. In an embodiment, the flow process returns to step 945 to check for another event if any of the determinations in step 982-992 are negative.

E. Rating System for Media Play Back

An embodiment of the invention includes a rating system with a media search and playback system. The rating system allows users to listen or view media segments available over the Internet according to a rating. In addition, users participate in determining rating media segments by providing a rating input after listening or viewing a media clip. The ratings may be used as a category, similar to other categories such as genres or categories.

FIG. 12 illustrates an architecture for use with the rating system, under an embodiment of the invention. The rating system 1000 may be employed

with, for example, the system 200 (FIG. 2). The rating system 1000 may include or cooperate with components of a system such as described with FIG. 2 to enable the user view and/or select media clips from play-lists. The generated play-lists may contain a list of links to media on the Internet. Selection of media clips by the user causes media to be played back to the user over the user terminal.

The rating system 1000 includes a backend database management component 1045. The database management component 1045 maintains organizational data structures such as tables that describe rating information for media clips. The media clips include Internet streaming audio or video. The rating information may be in the form of values such as, for example, total votes counted. In an embodiment, database management component 1045 maintains records that comprise meta information on each media clip including the URL to the media clip, the current rating of the media clip, and the total votes for that media clip.

A user 1010 on a user terminal interacts with a web-based playback interface 1020. As an example, play-back interface 1020 outputs play-lists 1018, 1022 to the user. The media clips in each play-lists may be outputted automatically, or displayed for the selection of the user. The play-back interface 1020 may also display to the user genre field 1016 or category field 1014 of the selected media clip, or play-list 1018, 1022. The playback interface 1020 includes features to enable a user on the user terminal to make entries or selections regarding preferences and opinions, as well as other types of information. The user may also view ratings stored on backend database 1045. The user may enter selections by, for example, using icons or other display features. The user may make entries by, for example, inputting text or voice. FIG. 12 illustrates a rating selection component 1012 as a feature of play-back interface 1020. As an example, the rating selection component 1012 allows users to rate a media output between a scale of 1 to 5.

A user 1010 may input a rating to play-back interface 1020. The rating is signaled from play-back module 1020 to a rating module 1030. In an embodiment, rating module 1030 maintains a tally for each media clip. The tally compiles ratings received from play-back module 1020. The ratings may

be received from more than one user and/or user terminal. The tally may be implemented through a protocol that enables the rating module 1030 to organize media clips according to an order. The organization of the media clips may correspond to a user preferential list, where preferred media clips are, for example, listed together or listed before less preferred clips. The rating module 1030 may also determine a genre, category, or other organization information through selections or entries received from the play-back module 1020. The selections may be tallied through any protocol, such as summation, averages, weighted averages and moving averages. In another embodiment, the rating module 1030 may maintain a text field to store user comments regarding each media clip.

In an embodiment, the rating component 1030 updates the rating information maintained in the database management component 1045. For example, the rating component 1030 may update values of the current rating and total votes for each media link.

A play-list generator 1040 generates play-lists based on rating information maintained in the database management component 1045. The play-list generator 1040 may signal to retrieve or receive records for each media clip. The play-list generator 1040 then automatically generates one or more play-list 1042. As previously discussed, each play-list is a list of media links. In an embodiment, the play-lists 1042 are generated according to the current rating and/or rating for each media clip. The generated play-lists are provided by the play-list generator 1040 for the play-back interface 1030.

The user 1010 may choose to listen to play-lists containing media clips rated according to one or more criteria. The play-lists may also be organized according to other factors, such as genre and category.

FIG. 13 is a flow chart that allows a user to listen to media clips that are rated according to one or more criteria. In step 1110, the user is provided a user-interface that allows users to receive media sorted according to one or more categories. The categories correspond to genres, such as type of music etc.

In step 1120, the user selects a category from the options presented by the user-interface. In response to the selection, the user terminal is provided

one or more play-list in step 1130. The play-list received by the user-terminal matches the category or genre selected by the user. Further, play-lists contain predetermined media links to media clips. The media clips in each of the play-lists are determined according to a rating system, using a system such as described by FIG. 12. The predetermined play-list may correspond to a play-list generated by play-list generator 1040 (FIG. 12). Once the play-list is received by the user terminal, the flow process returns to step 1120.

In step 1140, media clips are played back on the user terminal. The media clips are played back consecutively and automatically, so that the user experiences continuous media playback. For example, the play-lists may contain numerous media creations from a selected genre. The media creations may be determined for the play-list according to a rating formula. The user is provided the media creations of the selected genre continuously, so that the user's media experience resembles listening to an album.

FIG. 14 illustrates a flow process for updating a rating of a media clip, under an embodiment of the invention. In step 1210, a module is provided a rating event. The rating event is a rating for a particular media clip, having an associated URL. The rating from the user is predefined from a closed set. For example, the user may provide a rating from 1 to 5.

In step 1220, a record is located for the media clip that was currently rated. The record may be stored in a database, and include the media link for the media clip, the current rating of the media clip, and the votes received for that media clip. In an embodiment, the record may include more than one URL associated with the media clip that was rated. In an embodiment, the record is maintained in database management component 1045 (FIG. 12).

In step 1230, a rating field for the media record is updated. The rating field may correspond to the current rating of a media clip. A module such as the rating module 1030 may update the rating field in database management component 1045 (FIG. 12). The media record is updated to determine a new rating. In one embodiment, the new rating is an averaged based formula. The formula may also be weighted. An example of a formula to determine a rating, under an embodiment of the invention is:

Newrating= 1/(n+1) (N*(old rating)+user provided rating)

N is the total number of votes received, and newrating ranges between 0 and a maximum value.

In step 1240, record for the media clip rated is further updated to add an additional vote to the field for votes received. The flow process then returns to step 1210.

FIG. 15 illustrates an exemplary structure for a database to maintain updated records on ratings and votes tallied. The table may associate values corresponding number of votes, rating, and other information to a media link containing a media clip.

FIG. 16 illustrates a flow process for generating media clips into play-lists according to a rating criteria. Play-lists including a rating criteria are referred to as rated play-lists. The flow process assumes known categories for media clips. The flow process also assumes a rating for rated media clips, and the number of media clips in a rated play-list. The flow process may be used with any of the aforementioned embodiments.

In step 1410, a next category may be fetched from a database containing the different categories of media clips. In step 1420, the system makes a determination as to whether a category was received. If no category is received, the system assumes that there are no more media categories to be rated.

In step 1430, a new play-list is created for a current category. In step 1440, up to N rated media clips from a database of rated media clips are added to the play-list. Preferably, N is a constant in the flow process. Then in step 1450, an old play-list is deleted, and the new play-list is saved. The new play-list may be saved in a format that follows predefined protocol so that the play-list and its contents are accessible to a streaming media play back interface. The flow process then returns to step 1410.

FIG. 17 illustrates a flow process for programmatically categorizing media files. The process assumes a database containing metadata associated with media clips. The metadata includes metadata provided by a human editor. For example, the metadata may pertain to categories such as genre, mood and atmosphere.

In step 1510, a record is retrieved from the database. The record is retrieved with metadata information containing a first type of metadata information and a second type of metadata information. As an example, the first type of metadata information may correspond to a genre of music, and the second type of metadata information may correspond to an artist. In step 1520, a determination is made as to whether a record was received. If the determination is negative, then the process assumes that all media clips have been categorized.

If the determination in step 1520 is positive, then all records in the database having the first type of metadata information are retrieved in step 1530. In step 1540, all records retrieved in step 1530 are updated to include the second type of metadata information. As an example, all records belonging to a particular artist (first type of metadata information) or given additional metadata information of a particular genre (second type of metadata information). The process then returns to step 1510 to retrieve another record.

In one embodiment, the second type of metadata information is a genus category, and the first type of metadata information is a species of the first type of metadata information. Once the first record is known to have the a particular species and genus, the genus may be determined and stored for all records having the same species.

F. Personalized Media Playback

FIG. 18 is a flow process to create personalized play-lists of streaming media files available on the Internet (or other networks). The play-lists may be personalized by users on user-terminals.

In step 1610, a user chooses to add a URL of a selected media clip to a personal favorite play-list. In step 1620, the flow process adds the URL (and metadata) of the selected media clip to a user terminal store for user persistent information, such as an Internet cookie. The persistent data store is then accessible for the web-based play back application on the user terminal.

In step 1630, the user selects to play back media clips from that user's favorite play-list. In step 1640, the system reads back the media clips from the persisted data store. In step 1650, the system plays media clips using a URL

associated with each media clip. The cookie may also provide additional URLs. Thus, multiple media clips may be played continuously from different sites on the Internet.

The user may edit the play-list, change an order of the play-list, or delete selections from the play-list. The user may designate certain play-lists as personal, so as to identify the play-list with that user's terminal. Alternatively, the play-list may be stored on a network server and accessed using the media location and playback module. Users may access their personal play-lists from any one of a plurality of terminals that have access to the system.

G. Distributed Architecture

An implementation under an embodiment provides a distributed architecture in which a user terminal accesses media resources from a plurality of network sites. In a network such as the Internet, the user terminal accesses multiple web sites to playback media locates as files on those web sites.

A network site includes any network location having internal links. Embodiments of the invention access network sites providing links to media files and/or other network sites. A web site refers to a network site on the Internet. Examples of web sites include web pages, including web pages with HTML links to other web sites, to media files, and to other types of files.

The distributed architecture inverts conventional media distribution paradigms. Numerous streaming media files can be streamed to an individual user terminal continuously from throughout the Internet using the embodiment of the distributed playback architecture. The distribution architecture is scalable to provide thousands or millions of streaming media files to user terminals. The users can then play media files located throughout the Internet in a continuous manner from the numerous Internet sites.

FIG. 19 illustrates a distributed playback architecture, under an embodiment of the invention. A user terminal 1710 has access to N network sites that provide access to media, also referred to here as media sites. The N media sites 1722 via web server module 1770. The media sites 1722 each have one or more links to media web resources. The links are represented by URLs 1-N. The web server module 1770 can load the media resources onto a media

playback component of user terminal 1710. Once loaded, the media resources are played back by a media playback component on user terminal 1710.

In an embodiment, the media sites 1722 correspond to different locations on a network such as the Internet. For example, media sites may have different Internet addresses, including different domains. Each media site provides direct access to a media network resource. This implies that a URL (or link) to one of the media sites accesses the media network resource for playback without accessing another internal URL (or link).

In an embodiment, web server module 1770 signals multiple URL links to user terminal 1710. The media playback component of user terminal 1710 accesses each link to playback the media resource. The URLs are selected for media playback so as to output media from user terminal 1710 according to a predetermined program.

In an embodiment, the program is selected or defined from a search request of user. For example, a search request may designate a category for media output, such as a genre and artist. All URLs containing media from that artist and genre may be gathered and signaled from web server module 1770 to user terminal 1710. The URLs may be provided in any order, such as random, etc. or a chronological order of the artist.

In another embodiment, a program may be provided by one or more play-lists. Each play-list in the program may be generated by, for example, a play-list generator 1040 (FIG. 12). The play-lists may be personalized for the user of the end terminal 1710. For example, play-lists may be generated for preferences and profiles specified by the user of user terminal 1710. As another example, a user may couple to the Internet, prompting web server module 1770 to automatically signal one or more play-lists containing the URLs to user terminal 1710. Still, other embodiments provide for URLs to web resources, or play-lists containing the URLs to be randomly provided to user terminal 1710.

Among other advantages, the distributed architecture permits simultaneous playback of, for example, thousands or millions of multiple streams which do not congregate on a single point. This avoids congestion arising under examples of the current media paradigms. This ensures that the embodiment of our distributed architecture may "scale," or permit the

simultaneous playback of, for example, thousands or millions of simultaneous streams. Further, the quality of the user experience is not affected by scaling a system under the distributed architecture embodiment.

In contrast, conventional broadcasting employs one radio or television signal to broadcast to listeners or viewers. Media files disseminated over the Internet today may be distributed in a manner which is somewhat similar in that the media file is located on a single server (or small group of servers) which is accessed by potentially large number of Internet users. As a result, the experience of the users may diminish due to the limited ability of current systems to scale.

This distributed playback architecture, the delivery of streaming media through this playback architecture, in combination with the search functionality performed by the back-end module, and the rating and personalization features of the playback client terminal module permits the creation of a broadcasting system that is personalized by an end user. A personal broadcasting system permits each individual user to create media programs which can be sent to, for example, thousands or millions or other users who can simultaneously play different programming combinations using a distribution of Internet (or other network) sites.

An example of a distributed architecture playback system includes wireless devices that are communicatable to a network containing media resources. For example, media playback component 1710 may be loaded onto a wireless access protocol (WAP) enabled device. Examples of WAP enabled devices include handheld computes and cell phones. The WAP enabled device may use a wireless communication network to access network server module 1770. The WAP enabled device may also include output features, such as speakers or a display screen. The WAP enabled device accesses media sites 1722 by control of network server module 1770. The WAP enabled device then plays back media from the media sites 1722. The WAP enabled device may then be used to simulate a portable radio.

As another example, an automobile may be equipped with a wireless device. The wireless device accesses multiple media sites on a network such as the Internet to and provide playback of media clips. For example, the user may

select to hear music from a favorite play-list using the WAP enabled device in the automobile.

H. Messaging Applications

FIG. 20 is a diagram illustrating a messaging application, under an embodiment of the invention. The messaging application enables the user to share a media playback experience with other users having access to the network.

FIG. 20 assumes the messaging application is operated on a network such as the Internet. In the embodiment, a network interface or network-side module is used to enable messaging, rather than a client messaging applications. Examples of messaging applications for use with embodiments include e-mails, which are delivered to a folder on a recipient's terminal. Other types of electronic messages include instant messages, which can be displayed or heard on the recipients terminal automatically upon arrival.

A messaging module 2080 receives a messaging request from a first user terminal (sender) 2010. The messaging module 2080 may be an application or portion of network server module 2070. The messaging request is entered by the user through the user-interface 1900, using for example, an e-mail selection field 1990.

The messaging module 2080 receives addresses to deliver messages to recipient terminals (recipient) 2020. The sender 2010 may manually signal the recipients address using entry methods such as keyboards, graphic user selection features, or audio commands. Alternatively, messaging module 2080 has access to network stored addresses for the specific user. The network stored messages are then selectable from a terminal by the user on the sender terminal 2010.

In response to a request from sender 2010, messaging module 2080 generates a message 2085 for the recipient. The request may also include the address of the intended recipient(s). The message 2085 is sent to all recipients 2020 specified by sender 2010. The contents of the message 2085 include a URL to the network server module 2070. In an embodiment, the URL in the message is packaged with arguments or other coding to identify a play-list

maintained on the network server module 2070. The URL may also be packaged with arguments to identify the specific song being played when the sender causes the message to be transmitted to the recipient. Alternatively, the URL may identify to the recipient the search request or criteria used by the sender.

The recipient may choose to return a message 2082 to signal messaging module 2080. In one embodiment, the content of the message is constructed so that once the message is opened, the user can select a link to a module that stores or maintains the play-list 2075. For Internet applications, the link is HTML formatted to include the URL of network server module 2070, and arguments to identify the play-list selected by sender 2010. Once network server module 2070 is accessed by the recipient 2020, arguments 2088 contained with the link identify the specific play-list 2075 experienced by sender 2010 when the request to send the message was made.

If the message is instant, the recipient 2020 can respond immediately to simultaneously share the experience of sender 2010. Alternatively, the recipient 2020 can be made to respond automatically upon the recipient 2020 receiving the message 2085, so as to enable sender 2010 and 2020 to simultaneously or concurrently share the same media playback.

The argument 2088 that is packaged with the link may also identify individual media clips, and/or an entire play-lists. The recipient 2020 is able to experience media playback from individual media clips selected by sender 2010.

In another embodiment, message 2085 is constructed so that once the message is opened, the user is automatically connected to network server module 2070. The message may be an e-mail, stored in a designated folder of recipient 2020. The e-mail may include an HTML formatted URL to cause the recipient's terminal to access and communicate with network server module 2070. The HTML formatted URL may also include code that causes the user terminal to automatically access network server module 2070 upon the e-mail being opened. The HTML formatted link may also include arguments to specify the play-list 2088 and/or media clip identified by the sender, as well as other parameters of the URL. Once the play-list or media clip is identified by

network server module 2070, the recipient 2020 is able to share the media playback experience of the sender 2010. The sender 2010 can experience the media playback at the time sender 2010 requests the message to be sent.

In the embodiments shown, sender 2010 can select a media program that is signaled transmitted to recipient 2020 by messaging module 2080. The program may correspond to one or more play-lists, playing back multiple media resources. While sender 2010 is being played back the program, the sender 2010 can specify the address of recipient 2020 to messaging module 2080. The messaging module 2080 generate a message that includes a selectable link to enable the recipient to access the network server module 2070. Arguments or scripting contained with the URL identify the particular play-list being signaled to the sender 2010. Since the play-list is updated after every media resource is played back to sender 2010, recipient 2020 accesses the play-list at the selection being played back to the sender 2010. The play-list is then signaled to the sender 2010 and recipient 2020 simultaneously, or approximately thereabout. Alternatively, recipient 2020 accesses the play-list beginning with the media clip played back to sender 2010 when the sender 2010 selected to transmit the message to recipient 2020.

As an example, sender 2010 transmits a search request causing media, based on search criterias of a specific artist and a ranking. The network server module 2070 identifies URLs matching the search request and forms play-list 2075 for sender 2010. After reviewing the play-list 2075, the sender 2010 decides to share the media playback with a friend, recipient 2020, whom the sender believes would appreciate play-list 2075. The sender 2010 requests messaging module 2080 to transmit message 2085 to recipient 2020 by submitting the recipient's e-mail address to the messaging module 2080. The message 2085 sits on the recipient's terminal until accessed. The recipient 2020 selects message 2085 to access play-list 2075. Unless the messaging is nearly instantáneous, the recipient experiences media playback from the play-list 2075 when sender 2010 request message 2085 to be sent. Alternatively, sender 2010 may request the entire play-list 2075 to be transmitted to recipient 2020. In this way, sender 2010 and recipient 2020 may share a common interest in certain genres, category, artists etc. of media playback.

I. User-Interface

FIG. 21 illustrates a user-interface 1900, under an embodiment of the invention. The user-interface 1900 may correspond to the play-back interface 1020, described with FIG. 10. Alternatively, the user-interface may be a terminal side component in communication with one or more server-side modules, such as for example web server module 1070 (FIG. 12).

In an embodiment such as shown by FIG. 12, user-interface 1900 includes a plurality of user-interactive features. The user-interactive features enable users to interact with the system 200 from the user terminal 210. Some of the plurality of user-interactive features allow users to submit search requests and other media requests for playback. Other control user-interactive features allow users to affect the play back of the media resources.

The user-interface 1900 may output to the user information, images, and/or audio that is different than the media resource being played back. For example, user-interface 1900 displays metadata information to the users about the media resource being played back. In addition, the user-interface 1900 enables users to, for example, view advertisement, receive electronic messages, and create and manage play-lists.

In an embodiment such as shown by FIG. 21, the user-interface 1900 includes a first menu field 1910, a second menu field 1920, and a third menu field 1930. The first menu field 1910 allows the user to select a first criteria for media resources that are to be played back. The second menu field 1920 allows the user to select a second criteria from a set of media resources matching the first criteria. The third menu field 1930 allows the user to select a third criteria from the a set of media resources matching both the first and second criteria. Each of the menu fields 1910-1930 may be in the form of click and drag-down menus.

The user-interface 1900 may also include a text field 1940. The text field 1940 allows users to enter a search criteria. The search criteria entered in text field 1940 may be combined with the search criterias of one or more menu fields 1910-1930 using a Boolean operation. Preferably, all search criterias are AND together into a single search criteria. For example, the search criteria

entered in text field 1940 may correspond to an artist name, or a title of a media creation.

In an embodiment, the user-interface 1900 provides features that prompt a user for input, such as for one more search criterias. The web server module 270 receives the search criteria(s) signaled from user terminal 210, and access media and metadata table 247. Each of the menu field 1910-1930 may also allow users to enter text field as the search criterias. The search criteria(s) are matched to URLs containing metadata having the same (or equivalent) criterias. For example, the search request may specify a genre, and a first name of an artist. Then, web access server 270 locates URLs to media resources having associated metadata information that identifies the media resource as being of the same genre, and as containing the same first name in the artist name metadata indexed data structure.

The web server module includes a feedback display portion 1950. The feedback display portion 1950 may signal information, messages, advertisement etc. to the end user. In an embodiment, feedback display portion 1950 displays metadata information about the media resource being played back. For example, a song of a particular genre and category may be played back. The display screen portion 1950 may display the title of the song, the artist name, a play-list associated with the song, a rating component of the song, and the song's duration. Information is read when the media playback component loads the media resource.

Other user-interactive features may also be included in user-interface 1900. In an embodiment, user-interface 1900 includes a play-list feature 1960. The play-list feature 1960 enables users to add a media creation to a play-list. The play-list feature 1960 may, as an example, be a selectable icon. Upon selecting the play-list feature 1960, a pop-up window (not shown) may be displayed allowing a user to name or select the play-list that will include the media resource being played. In this way, a user of user terminal 210 can provide input to create and manage play-lists, using systems such as described with FIG. 12 and 19.

The user-interface 1900 may include one or more control user-interactive features. The control user-interactive features may be in the form of

selectable icons. A skip feature 1972 causes, for example, web server module 270 to signal a URL of another media creation to the media playback component. This causes the media playback component to start playing back a new media creation. A pause feature 1974 enables users to pause the media playback component from playing back the media resource. The pause feature 1974 may signal the media playback component directly, or cause the web server module to signal the command to the media playback component. Reselecting the pause feature 1974 then causes the media creation to be played back from the portion where playback was paused. Similarly, a seek feature 1976 may signal to seek or move to a specific instance of playback on the media resource. A volume feature 1978 signals the application program interface 276 (FIG. 5) to raise the volume of the media resource being played back.

The user-interface 1900 may also include a rating feature 1980. The rating feature 1980 may be in the form of multiple selectable icons, where the icons are arranged to correspond to a rating. For example, five icons may be provided to represent best to worst ratings. In an embodiment, the rating feature 1980 enables a user to rate a media resource during or after it is played back on the user terminal 210. With reference to an embodiment such as described with FIG. 12, the rating feature 1980 is used to prompt a user to signal a rating to rating component 1030 (FIG. 12). The rating feature 1980 may be a user response to a media clip played back on user terminal 210. The rating component 1030 receives the rating and modifies rating information associated with the URL that is stored in 1045. The rating information may then be provided to other users or user terminals. For example, the rating information may then be signaled to display portions 1950 of other user terminals 210 who select that media clip for playback.

The user-interface 1900 also includes a personal play-list feature 1985. The personal play-list feature includes iconic selection features, including an add icon 1987 to add a URL to a play-list, and a play icon 1989 to play a personal play-list. The add icon 1987 enables a user to signal play-list generator 1040 (FIG. 12) to add a URL to the personal play-list. The URL being added to the play-list may correspond to a media resource being played back on user terminal 210. The play icon 1989 may be selected to cause web server module

1070 (FIG. 12) to signal URLs from the personal play-list to the media playback component of user terminal 210. In this way, user terminal 210 may select to have continuous media output from resources previously selected to be on a play-list.

The user-interface 1900 may also include an e-mail selection feature 1990. The e-mail selection feature 1990 may be iconic, to allow selection by the user upon the media playback. Once selected, an e-mail program on user terminal 210 may be launched. The e-mail program may be directed to open a new message, and attach the URL of the selected media resource.

FIG. 22 illustrates an embodiment in which user-interface 1900 is displayed on the desktop along a second window 2210 showing a web site 2212. The web site 2212 hosts the media file being played back. In this embodiment, web server module 1070 signals a media file URL to the media player component of the terminal. The web server module 1070 concurrently signals the web browser component 213 on the terminal another URL to the hosting web site. The web browser 213 opens the second window 2210 to display the web site while the media from the media file is being played back on the terminal. In this way, users are displayed the web site hosting the media file while media from the media file is played back. This allows the user to view, for example, banner ads, artist name and titles, and copyright information while media from the web site is being played back.

After the playback is complete for one media file, a URL to a next media file is signaled to the media player component on the terminal. The next URL may be determined by a sequence of a play-list, or by a result to a search term inputted from the user. If the URL of the next media file is hosted on a web site that is different than the preceding web site, then web server module 270 signals the URL of the next hosting web site to the web browser. The second window 2210 then displays a second web site 2212' that hosts the media file being played back. In this way, the second window 2210 displays only web sites hosting the media files being played back.

J. Conclusion

The foregoing description of various embodiments of the invention has been presented for purposes of illustration and description. It is not intended to limit the invention to the precise forms disclosed. Many modifications and equivalent arrangements will be apparent.

## CLAIMS

What is claimed is:

1. A method for playing back media from a network, the method comprising:

receiving a search criteria from a network enabled device;

accessing a database comprising a plurality of network addresses, the database associating each address with one or more classes of information, each address accessing a media resource;

selecting at least one address in the database using the search criteria;

signaling the selected address to the network enabled device; and

controlling the network enabled device so as to automatically access and play back the media resource of the selected address.

2. The method of claim 1, wherein selecting at least one address in the database includes matching the search criteria with a parameter in the one or more classes of information associated with that address.

3. The method of claim 1, wherein accessing a database comprising a plurality of network addresses includes accessing a plurality of links to Internet sites, each link containing no other internal link.

4. The method of claim 3, wherein selecting at least one address in the database using the search criteria includes selecting a plurality of links in the database using the search criteria, signaling the selected plurality of links to the network enabled device, and programmatically controlling the network enabled device so as to automatically access and sequentially play back the media resource of each of the plurality of selected links in a designated order.

5. The method of claim 4, wherein controlling the network enabled device so as to automatically access and sequentially play back the media resource includes sequentially playing back the media resource of each of the plurality of selected links after accessing the respective selected link.

6. The method of claim 3, wherein receiving a search criteria from a network enabled device includes receiving the search criteria corresponding to an artist name, and wherein selecting at least one address in the database using the search criteria includes selecting a plurality of links that are each associated with a class of information containing a parameter corresponding to the artist name.

7. The method of claim 3, wherein receiving a search criteria from a network enabled device includes receiving the search criteria corresponding to a title of a network media resource, and wherein selecting at least one address in the database using the search criteria includes selecting a plurality of links that are each associated with a class of information containing a parameter corresponding to the title of the network media resource.

8. The method of claim 2, wherein receiving a search criteria from a network enabled device includes receiving the search criteria corresponding to a musical category, and wherein selecting at least one address in the database using the search criteria includes selecting a plurality of links that are each associated with a class of information containing a parameter corresponding to the musical category.

9. A method for playing back media from a network, the method comprising:

receiving a request for media playback entered on a network enabled device;

accessing a database comprising a plurality of network addresses, each address accessing a media resource;

identifying at least two addresses from the database;

signaling each identified address to the network enabled device; and

controlling the network enabled device to access and automatically play back the media resources of each of the signaled addresses.

10. The method of claim 9, wherein controlling the network enabled device to access the media resources of the signaled links includes signaling a uniform resource locator for one or more of the media resources to a media playback

component to cause the network media resources of the signaled links to be accessed and played back on the network enabled device.

11. The method of claim 10, wherein receiving a request for media playback includes receiving the request for media playback from an Internet enabled device, and wherein the method further comprises signaling the uniform resource locator of the one or more media resources to a web browser component on the Internet enabled device to cause a web page to be displayed on the Internet enabled device while the media playback component plays back the media resource on the network enabled device.

12. The method of claim 11, wherein receiving a request for media playback from a network enabled device includes receiving a request for a play-list comprising a plurality of addresses, the play-list arranging the plurality of addresses so that the addresses are loaded by the media playback component in a designated order, wherein identifying at least two addresses in the database includes identifying the addresses in the play-list, and wherein controlling the network enabled device to access and automatically play back the media resources of the signaled addresses includes accessing and playing back each media resource in the play-list sequentially in the designated order.

13. The method of claim 12, wherein receiving a request for media playback from a network enabled device includes receiving a request for a program comprising multiple play-lists, each play-list being corresponding to a predetermined selection of media resources, wherein identifying at least two addresses includes identifying the addresses in each of the play-lists in the program, and wherein controlling the network enabled device to access and automatically playback the media resources of the signaled addresses includes accessing and playing back each media resource in a sequential order designated by the play-lists of the program.

14. A computer system for playing back media from a network, the computer system comprising:

a network enabled device comprising a media playback component;

a database comprises a plurality of addresses, each address locating a media resource on the network;

a network server module that communicates with the network enabled device and with the database, the network server module being able to receive a search request entered on the network enabled device that specifies one or more criterias, to select at least one address from the database that is associated with a class of information that matches the search criteria, and to cause the media playback component to load the media resource located by the selected address.

15. The computer system of claim 14, wherein the database stores one or more classes of information associated with each address in the plurality of addresses.

16. The computer system of claim 15, wherein the database is locatable by the network enabled device on the network.

17. The computer system of claim 15, wherein at least a portion of the database resides on the network enabled device.

18. The computer system of claim 14, wherein the network server module signals the selected address to the network enabled device to cause the media playback component to load the media resource located by the selected address.

19. The computer system of claim 18, wherein the network server module communicates with the network enabled device through the network.

20. The computer system of claim 14, wherein the network server module is located at least partially on the network enabled device and communicates with the database through the network.

21. The computer system of claim 14, wherein the network server module comprises a sequence of code that is signaled to the network enabled device from another device on the network, the sequence of code being executable on the network enabled device.

22. The computer system of claim 14, wherein the network enabled device comprises the media playback component, and wherein the network server module programmatically controls the media playback component of the network enabled device to playback the media resource.

23. The computer system of claim 14, wherein the network enabled device is a network enabled device selected from a group of devices consisting of a personal computer, a handheld computer, a smart network appliance, and a wireless Internet enabled device.

24. The computer system of claim 14, wherein the database comprises a plurality of links to Internet sites, wherein each link accesses a media resource without requiring another internal link.

25. The computer system of claim 14, wherein all or a portion of the database resides on the network enabled device.

26. The computer system of claim 14, wherein all or a portion of the database is accessible to the network enabled device over the network.

27. The computer system of claim 14, wherein the one or more classes of information for each address in the database include types of metadata selected from the group consisting of genre, title, and data format of the network resource.

28. The computer system of claim 14, wherein the media resource is a streaming media file that outputs a combination of at least video or audio once the media resource is loaded by the media playback component.

29. The computer system of claim 14, wherein the network includes the Internet, the network enabled device includes an Internet enabled device, each of the plurality of addresses includes links to a media web resource, and wherein the network server module signals control information to the Internet enabled device to cause the Internet enabled device to programmatically access each of a plurality of media web resources signaled to the network enabled device.