Title: CONTROL ARCHITECTURE FOR AUDIO/VIDEO (A/V) SYSTEMS

Abstract: A network based home audio/video control systems. In one embodiment, the system includes a plurality of audio/video (A/V) devices, an A/V interface panel in communication with the plurality of A/V devices, a switching matrix and an access device. The switching matrix is adapted to selectively control connections between the plurality of A/V devices through the audio/video interface panel. The access device is adapted to receive directions and produce control signals based on the received directions. Moreover, the access device is in communication with the switching matrix to control the switching matrix.
CONTROL ARCHITECTURE FOR AUDIO/VIDEO (A/V) SYSTEMS

Technical Field

[0001] The present invention relates generally to the field of audio/video (A/V) systems and, in particular, to network based home audio/video control systems.

Background Information

[0002] Typically, in a home, the ability to control music or video is restricted to the particular room where A/V systems (e.g., stereo receiver, CD player, VCR, DVD player etc.,) are located. A/V systems are controlled either manually or with a remote control device. The remote control device generally uses infra red signals for remote control which requires line of sight connection with the A/V system for proper operation. Hence the remote controls for A/V systems will not function adequately in another room.

[0003] It is desirable to have the ability to be able to listen to music or watch the video from A/V systems throughout rooms of a house. In order to listen to music or watch videos at different or multiple rooms in a house, multiple A/V systems may be required. Installing multiple A/V systems significantly increases the expense to provide this additional capability.

[0004] Certain audio/video system designs have been developed to limit the number of duplicate A/V systems in a home. These designs typically rely on proprietary hardware available in each room of the house that controls the A/V systems. Proprietary hardware typically provides an interface such as a keypad or user interface on the wall in each of the rooms where music or video is desired. The user interface is used to turn on or off the audio or video feed from the A/V system in one room to another room. In addition the homeowner can use the keypad to perform other functions such as increasing volume, changing channels etc. This design is a static design since the control is fixed to one part of the room. Such proprietary systems restrict flexibility and are not scalable because it is difficult to add or change rooms after the initial installation of these proprietary solutions. Moreover, these proprietary designs also assume that the house is pre-wired to receive audio/video transmission in the different rooms.
[0005] For the reasons stated above, and for other reasons stated below that will become apparent to those skilled in the art upon reading and understanding the present specification, there is a need in the art for an improved audio/video system. The proposed system reduces the overall cost of the A/V system and also provides for a scalable design.

[0004]

Summary of Invention

[0006] The above-mentioned problems with architectures using traditional A/V systems are addressed by embodiments of the present invention and will be understood by reading and studying the following specification.

[0007] In one embodiment, an audio/video control system is disclosed. The system includes, a plurality of audio/video (A/V) devices, an A/V interface panel in communication with the plurality of A/V devices, a switching matrix and an access device. The switching matrix is adapted to selectively control connections between the plurality of A/V devices through the audio/video interface panel. The access device is adapted to receive directions and produce control signals based on the received directions. Moreover, the access device is in communication with the switching matrix to control the switching matrix.

[0008] In another embodiment, an audio/video (A/V) control system includes one or more access devices, a controller and one more A/V devices. Each access device includes a GUI that is adapted to describe controls for one or more A/V devices. The access device further has an input to select specific controls described in the GUI. The controller is in communication with the one or more access devices. The controller is further adapted to process signals from the one or more access devices and produce control signals based on the signals from the one or more access devices. In addition, the one or more A/V devices are in communication with the controller. Each A/V device is adapted to be controlled by the control signals from the computer controller.

[0009] In still another embodiment, a method for controlling an audio/video (A/V) system using a network interface is disclosed. The method comprises directing a controller using an access device. Generating control signals at the controller based on the directions of the access device. Controlling a switching matrix with at least
one of the control signals and switching A/V signals between input and output interfaces with the switching matrix.

[0010] In further another embodiment, a method for controlling an audio/video (A/V) system using a network interface is disclosed. The method comprises displaying a graphic user interface (GUI) on an access device in response to a prompt. Providing directions in response to the GUI. Sending the directions to a controller. Processing the directions with the controller and outputting control signals based on the directions and controlling the inputs and outputs of A/V devices based on the control signals.

[0011] In still further another embodiment, a method of controlling audio and video (A/V) devices is disclosed. The method comprises executing a software program. Displaying a graphics user interface (GUI). Directing control of a select A/V device via the GUI. Sending control directions to a server program and controlling the select A/V device with the server program.

[0012] In yet still another embodiment, a computer readable medium including instructions for controlling one or more audio/video (A/V) devices is disclosed. In one embodiment, the instructions comprise invoking a GUI screen in response to a prompt. Directing control of select A/V devices with use of the GUI screen. Processing control directions with a controller and controlling a switching matrix based on select processed control directions to selectively connect outputs of select A/V devices to inputs of select A/V devices.

[0013] Further yet in another embodiment an audio/video (A/V) control system is disclosed. The system comprises an access device, a controller, a plurality of A/V devices and a switching device. The access device provides a user interface. The controller is in communication with the access to process signals from the access device. The controller further is in communication with web server. The plurality of A/V devices are adapted to be controlled by the controller. Each A/V device has an input and an output. The switching device is adapted to switchably connect select A/V inputs to select A/V outputs. The switching device is controlled by the controller.
Brief Description of Drawings

[0014] The present invention can be more easily understood and further advantages and uses thereof more readily apparent, when considered in view of the description of the preferred embodiments and the following figures in which:

[0015] Figure 1 is a detailed block diagram of one embodiment of a network based control architecture for A/V systems;

[0016] Figure 2 is an illustration of one embodiment of a network based control architecture for audio systems;

[0017] Figure 3 is an illustration of one embodiment of a network based control architecture for A/V control systems;

[0018] Figure 4 is a flowchart of the method of operation of one embodiment of a network based control architecture for A/V systems;

[0019] Figure 5 is a flow chart of the method of operation of another embodiment of a network based control architecture for A/V systems; and

[0020] Figure 6 is an example of a graphical user interface for a network based control architecture for A/V systems of one embodiment of the present invention.

[0021] In accordance with common practice, the various described features are not drawn to scale but are drawn to emphasize specific features relevant to the present invention. Reference characters denote like elements throughout Figures and text.

Detailed Description

[0022] In the following detailed description of the preferred embodiments, reference is made to the accompanying drawings that from a part hereof, and in which is shown by way of illustration specific embodiments in which the invention may be practiced. These embodiments are described in sufficient detail to enable those skilled in the art to practice the invention, and it is to be understood that other embodiments may be utilized and that logical, mechanical and electrical changes may be made without departing from the scope of the present invention. The following detailed description is, therefore, not to be taken in a limiting sense.

[0023] Embodiments of the present invention provide a mechanism for controlling an A/V system. For example, in one embodiment, the mechanism uses a network based
control architecture for an A/V system. In another embodiment the mechanism uses a network based control architecture for home based audio/video systems using a microprocessor interface. In an alternate embodiment, the invention provides a control mechanism using an integrated A/V system. Referring to Figure 1, a block diagram of a control system 100 with network based control architecture for A/V systems of one embodiment of the present invention is illustrated. As illustrated, system 100 comprises an A/V input interface source 120, A/V output interface source 130, a network controller 170, an A/V interface panel 140 and a computer controlled mixer 150. The input interface source 120 of this embodiment includes wall jacks 122 and surveillance cameras 124 and the output interface source 130 of this embodiment includes wall jacks 132 and amplifiers 134. Wall jacks 122 and 132 are situated in various rooms in a building and are adapted to receive and send signals from and to a variety of audio/video equipment. In one embodiment, the wall jacks are adapted to receive RCA, S-video and digital inputs.

[0024] Interface sources 120 and 130 are coupled to an A/V interface panel 140 which is in turn coupled to a computer controlled mixer 150. In one embodiment, the interface panel 140 is at a central location where all the inputs from various rooms are terminated and it provides easy access to the various input signals for fault isolation. The computer controlled mixer 150 is controlled by a network controller 160 that comprises of a network interface 162, control interface 166 and a computer controller 164. In one embodiment, the computer controller 164 runs an operating system such as Windows Media Edition or the like. In another embodiment, the computer controller 164 (controller 164) uses radio remote control or a web interface control to connect to the switched matrix. The computer controller 164 also may host a wireless access point or router. In one embodiment, the computer controlled mixer 150 provides the function of switching individual inputs to outputs based on instructions from the computer controller 164.

[0025] In one embodiment, the network interface 162 (e.g., PDA, laptop, desktop, remote control or the like) sends control signals via the control interface 166 to the computer controller 164 to achieve control of mixer 150. The control interface 166 could be either a wireless or a wired connection. In another embodiment, the computer controller 164 is coupled to a web-server 170 that provides remote access, control and surveillance of the A/V system. In one embodiment, the web-server 170
is a personal computer. The web-server 170 executes a web-server application to control A/V devices and send any audio or video streams from the A/V devices over the internet or LAN to a remote location. In one embodiment, the system 100 uses an Ethernet network for communication between devices.

[0026] System 100 further includes A/V input panel 142 and A/V output panel 144. Depending on the specific application, the outputs 136, 138 may be amplified, or left at the program level. Inputs 126 and 128 are in communication with the input panel 142. In one embodiment inputs 126 and 128 are adapted to be directed to any of the multiple outputs 136, 138 via a digitally controlled switching matrix 150. In one embodiment, analog inputs within 142 are first routed through a digital hardware within switching matrix 150. In one embodiment, switching matrix 150 includes filters. In another embodiment the analog signals are converted to a digital format at the interface 142. In one embodiment, streaming digital A/V may be added to the mix from a PC based user-interface connected to wall jacks 122. After all the digital filtering is completed, the signal is "mixed" to appropriate independent output channels 138, 136 and received at the amplifiers 134.

[0027] Figure 2 is an illustration of a network based control architecture for home based audio/video systems, indicated generally at 200, of another embodiment of the present invention. The home in this example is divided into zone-1 201, zone-2 202, zone-3 203 and zone-4 204 to indicate separate rooms. System 200 comprises an audio system 205 available at zone-4 203. The audio system 205 includes mixer 240 and amplifiers 250-1 through 250-N. Additionally, system 200 comprises a computer controller 290 (controller 290) which is coupled to the mixer 240 through a microprocessor interface 230. The computer controller 290 directs the mixer 240 to switch particular input channels to output channels based on commands received from any of the network interfaces 270-1 through 270-M. Network interface devices 270-1 through 270-M (access devices 270-1 through 270-M) illustrated in this embodiment, include a desktop computer 270-1, a laptop 270-2, a personal data assistant (PDA) 270-M. Other similar interface devices 270-1 through 270-M (access devices 270-1 through 270-M) can be used. The interface or access devices 270-1 through 270-M are used to direct the computer controller 290 via a switch/router 280. In this embodiment, A/V devices, microphone 210-1 and a CD player 210-2, are connected to a Pre-Amp section 220 of the audio system. Signals from the microphone 210-1
and the CD player 210-210-2 are received by the switching matrix 240 and amplifiers 250-1 through 250-N. The amplifiers 250-1 to 250-N are connected to speakers 260-1 to 260-N. In one embodiment, the switching matrix 240 is a mixer 240. In particular in one embodiment, an analog audio mixer 240 is used that is controlled digitally by the controller 290. Analog audio mixer 240 is adapted to provide outputs to select A/V devices. In this embodiment, microprocessor interface 230 is adapted to interface control signals between the controller and the analog audio mixer 240. Moreover, in this embodiment, the interface 230 sends different voltages to pots on the mixer 240 to control outputs. These outputs are amplified and sent to speakers in various parts of the home.

[0028] Figure 3 is an illustration of another embodiment of an A/V control system 300 of the present invention. The home of Figure 3 is divided into four zones zone-1 301, zone-2 302, zone-3 303 and zone-4 304 indicating separate rooms. System 300 at zone-4 comprises an integrated A/V system 305 that includes amplifiers 350-1 through 350-N that are connected to A/V devices, speakers 360-1 through 360-N. Also included in the integrated A/V system 305 is computer controller 322, network control server 324, switch matrix or mixer 326 and A/V interface panel 328. The computer controller may generally be referred to as a “controller 322”. Additionally, system 300 comprises A/V devices that include video cameras 340-1 and 340-2 and a television 330. Network interface devices 370-1 through 370-M direct the computer controller 322 via a switch router 380. Specifically, system 300 comprises of network interface devices such as a personal computer 370-1, laptop 370-2 and personal data assistant (PDA) 370-M. Network interface devices 370-1 through 370-M may also be referred generally as “access devices 370-1 through 370-M”. A standard web browser initiated in any of the network interface devices 370-1, 370-2 through 370-M establishes a connection to the switch matrix 326 or mixer 326. Upon establishing connectivity with the switch matrix 326 or mixer 326, commands are sent from the network interface to achieve proper switching of audio/video channels thereby making it available at the desired zones.

[0029] Figure 4 is a flowchart 400 of a method of operation of one embodiment of a network based control architecture for A/V systems of the present invention. In block 420 a network interface device such as a desktop computer, laptop or a PDA directs a computer controller using a software program to perform the function of switching a
certain A/V signals from certain ports to certain other ports. This includes directing the A/V system to provide audio or video connectivity to a particular room. In one embodiment, the software program resides in the network interface device. In yet another embodiment the software program resides remotely on a file server or a storage device. In block 430 the computer controller receives an appropriate signal from network interface device (or access device) and generates a control signal in block 440 which is analyzed at decision block 445.

[0030] In one embodiment, the decision block 445 checks the control signal to see if there is change in room location that requires operation of a switching matrix. If there is a need for changing the A/V signal from one room to another the control signal is passed along to the switching matrix/mixer as in block 450. The generated control signal is sent to the switching matrix/mixer as in block 450 following which it is received at the switching matrix/mixer as in block 460. In block 470 the A/V signals are switched between input and output interface sources to perform connectivity that was requested at the network interface in block 420.

[0031] In the event that the control signal does not require a room change but rather the control signal is for controlling a select A/V device, the control signal is directly sent to the particular device as in block 475 to perform the function that is required. For example, the control signals could be used for controlling parameters of an A/V device such as change volume, channel number, brightness, contrast, tilt a camera or change the aperture of a camera to zoom in or out as desired.

[0033] Figure 5 is a flowchart 500 of a method of operation of another embodiment of the present invention. In block 520, a user invokes a software program using a web server. Software programs such as scripting software (e.g., Java) maybe used in block 520. In one embodiment, the software program may be present either in the network interface device or available remotely on a server or a storage device. In one embodiment, internet technologies such as virtual private network (VPN) or tunneling may be used to establish a connection with the server. Following the invoking of the software in block 520, a graphical user interface (GUI) is displayed in block 530. The graphical user interface enables the user to control A/V devices and direct particular input A/V signals to various locations within the building. In one embodiment, the user has a broad range of control with respect to the various parameters of the audio/video signals such as volume, channel, color, brightness ...
etc. Figure 6 is an illustration of an example of a graphical user interface, indicated generally at 600 of one embodiment of the present invention. A/V controller 600 includes an audio control 602 and a video control 616. Audio control 602 is achieved by using either of volume control 604 or station control 606. Volume control 604 is used for increasing or decreasing the volume to desired level. Station control 606 is used to choose a particular channel or station. Also included are room selectors shown by 608, 610, 612 and 614 that is used to select a particular room to be activated for audio distribution. Similar to the audio control in one embodiment there is a video controller 616 that has volume control 618, channel control 620 and room selectors 622, 624, 626 and 628. In addition the A/V controller has camera controls 630, 632, 634 and 636 that is used to select the desired camera to be monitored. Also included in one embodiment is a monitor screen 638 to view video, images and other control parameters that can be adjusted at the A/V controller.

[0034] With embodiments of the present invention A/V signal can be streamed over local area networks (LAN) or the internet so that it will be available remotely. The present invention provides a cheap, versatile and better scaling A/V control system that can be implemented using proprietary control circuitry because only one piece of hardware (switching device such as a switching matrix or mixer) is needed. The rest of the access points use standard PC (or PDA) interfaces commonly in use today.

[0035] Although specific embodiments have been illustrated and described herein, it will be appreciated by those of ordinary skill in the art that any arrangement, which is calculated to achieve the same purpose, may be substituted for the specific embodiment shown. This application is intended to cover any adaptations or variations of the present invention. Therefore, it is manifestly intended that this invention be limited only by the claims and the equivalents thereof.
Claims

What is claimed is:

1. An audio/video control system, the system comprising:
   a plurality of audio/video (A/V) devices;
   an A/V interface panel in communication with the plurality of A/V devices;
   a switching matrix adapted to selectively control connections between the
   plurality of A/V devices through the audio/video interface panel; and
   an access device adapted to receive directions and produce control signals
   based on the received directions, the access device in communication with the
   switching matrix to control the switching matrix.

2. The system of claim 1, further comprising:
   a controller coupled between the switching matrix and the access device, the
   controller adapted to process the control signals and control the switching matrix.

3. The system of claim 1, wherein the audio/video device is one of an
   audio/video device selected from a group consisting of CD player, surveillance
   camera, speaker, microphone and amplifier.

4. The system of claim 1, wherein the access device includes a web browser and
   is connected to a web server to allow remote location control of the A/V devices.

5. The system of claim 1, wherein the access device has a graphic user interface
   adapted to solicit the directions.

6. The system of claim 1, wherein the switching matrix is a mixer.

7. The system of claim 1, where in the switching matrix includes a converter that
   converts the audio/video signals between analog and digital.

8. The system of claim 1, wherein the A/V interface panel includes a converter
   that converts the A/V signals between analog and digital.
9. The system of claim 1, further comprising:
   amplifiers that amplify the A/V signals sent and received by the audio/video interface panel.

10. The system of claim 1, further comprising:
    a controller adapted to control the switching matrix based on the control signals from the access device, the controller further adapted to control the A/V devices.

11. The system of claim 1, wherein the switching matrix is an analog audio mixer that is adapted to be controlled digitally by a controller.

12. A audio/video (A/V) control system, the system comprising:
    one or more access devices, each access device having a GUI adapted to describe controls for one or more A/V devices, the access device further having an input to select specific controls described in the GUI;
    a controller in communication with the one or more access devices, the controller adapted to process signals from the one or more access devices and produce control signals based on the signals from the one or more access devices; and
    one or more A/V devices in communication with the controller, each A/V device adapted to be controlled by the control signals from the computer controller.

13. The system of claim 12, further comprising:
    a router adapted to route signals from the one of more access devices to the controller.

14. The system of claim 12, wherein the A/V devices are one selected from a group of A/V devices comprising, a stereo, a CD player, a microphone, a video camera, a television and a speakers.

15. The system of claim 12, wherein the one or more access devices are one selected from a group comprising a computer, a phone with web access and personal digital assistant (PDA).
16. The system of claim 12, further comprising:
a switching matrix controlled by the controller, the switching matrix adapted
to selectively route control signals to select A/V devices and provide select signal
paths between select A/V devices.

17. The system of claim 16, further comprising:
one or more amplifiers adapted to selectively amplify A/V signals routed
between select A/V devices.

18. The system of claim 16, wherein at least one of the one or more devices is an
analog device, the system further comprising:
at least one analog to digital (A/D) converter to convert analog signals from
the at least one analog A/V device; and
at least one digital to analog converter (D/A) to convert digital signals from
the system to analog signals for the at least one analog A/V device.

19. The system of claim 18, further comprising:
at least one filter adapted to filter signals from the at least one A/D converter.

20. The system of claim 12, further comprising:
an analog audio mixer adapted to be controlled digitally by the controller, the
mixer adapted to provide outputs to select A/V devices.

21. The system of claim 20, further comprising:
a microprocessor interface adapted to interface control signals between the
controller and the analog audio mixer.

22. A method for controlling an audio/video (A/V) system using a network
interface, said method comprising:
directing a controller using an access device;
generating control signals at the controller based on the directions of the access
device;
controlling a switching matrix with at least one of the control signals; and
switching A/V signals between input and output interfaces with the switching matrix.

23. The method in claim 22, further comprising:
   communicating wirelessly between the access device and the controller.

24. The method in claim 22, further comprising:
   controlling an A/V device with at least one of the control signals.

25. The method of claim 22, further comprising:
   using a switched router to communicate between the access device and the controller.

26. The method in claim 22, wherein the access device is one of an audio/video device selected from a group of a Personal Data Assistant, a cell phone and laptop.

27. The method in claim 22, wherein the switching matrix is a mixer.

28. The method in claim 22, further comprising:
   providing access to the internet to allow control of and the passing of A/V signals to and from remote locations.

29. A method for controlling an audio/video (A/V) system using a network interface, said method comprising:
   displaying a graphic user interface (GUI) on an access device in response to a prompt;
   providing directions in response to the GUI;
   sending the directions to a controller;
   processing the directions with the controller and outputting control signals based on the directions; and
   controlling the inputs and outputs of A/V devices based on the control signals.

30. The method of claim 29, wherein controlling the inputs and outputs of A/V devices further comprises:
directing a switch matrix to selectively couple inputs and outputs of select A/V devices.

31. The method of claim 29, wherein controlling the inputs and outputs of A/V devices further comprises:
controlling an analog audio mixer digitally via an interface to selectively couple inputs and outputs of select A/V devices.

32. The method in claim 29, further comprising:
using a transmission control protocol/internet protocol (TCP/IP) interface between the access device and the controller.

33. The method of claim 29, further comprising:
coupling the access device and the controller to the internet to provide remote access.

34. A method of controlling audio and video (A/V) devices, the method comprising:
executing a software program;
displaying a graphics user interface (GUI);
directing control of a select A/V device via the GUI;
sending control directions to a server program; and
controlling the select A/V device with the server program.

35. The method of claim 34, wherein directing control of the select A/V device further comprises:
activating select controls illustrated in the (GUI).

36. The method of claim 34, wherein the software program is a web browser.

37. The method of claim 36, wherein the web browser invokes Java Applets.

38. The method of claim 34, wherein sending control directions to a server program further comprises:
sending TCP/IP control messages to the server program.
39. The method of claim 34, wherein controlling the select A/V device with the server program further comprises:
   sending directions serially to the A/V device.

40. The method of claim 24, wherein controlling the select A/V device with the server program further comprises:
   controlling a switch matrix.

41. A computer readable medium including instructions for controlling one or more audio/video (A/V) devices, the instructions comprising:
   invoking a GUI screen in response to a prompt;
   directing control of select A/V devices with use of the GUI screen;
   processing control directions with a controller; and
   controlling a switching matrix based on select processed control directions to selectively connect outputs of select A/V devices to inputs of select A/V devices.

42. The instructions of claim 41 further comprising:
   controlling one or more A/V with the controller based on select processed control directions;

42.43. The method of claim 42, further comprising receiving A/V signals from one or more A/V devices at the GUI screen.

The method of claim 41, further comprising:
   an audio/video (A/V) control system, the system comprising:
   an access device to provide a user interface;
   a controller in communication with the access to process signals from the access device, the controller further in communication with web server;
a plurality of A/V devices adapted to be controlled by the controller, each A/V device having an A/V input and an A/V output; and

a switching device adapted to switchably connect select A/V input to select A/V outputs, the switching device controlled by the controller.

44. The system of claim 43, wherein the switching device is a switching matrix.

45. The system of claim 44, wherein the switching device is an analog audio mixer adapted to be controlled digitally.

46. The system of claim 43, wherein the controller is adapted to stream A/V signals from the A/V devices over a local access network.

47. The system of claim 43, wherein the controller is adapted to stream A/V signals from the A/V devices over the internet.
Fig. 1
Fig. 4

Start

Directing computer controller at a network interface device, e.g., PDA, laptop

Receiving signal from network interface at the computer controller

Generating control signal at the computer controller

Sending control signal to switching matrix/mixer

Computer controller sending control signals to mixer

Switching A/V signals between input and output interfaces

End
Start

Invoking Java Applet Using a web browser

Displaying Graphical User Interface (GUI) that allows for A/V control options

Establishing connection between the GUI and the server

Sending messages from Java applet to server using TCP/IP

Relaying messages from Server to the computer controller

Computer controller sending control signals to mixer

Switching A/V signals at the mixer between various inputs and outputs

End

Fig. 5
**INTERNATIONAL SEARCH REPORT**

**A. CLASSIFICATION OF SUBJECT MATTER**

IPC 7 H04N7/24 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)

IPC 7 H04N 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

**C. DOCUMENTS CONSIDERED TO BE RELEVANT**

<table>
<thead>
<tr>
<th>Category *</th>
<th>Citation of document, with indication, where appropriate, of the relevant passages</th>
<th>Relevant to claim No.</th>
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abstract; figure 5
column 5, line 40 - line 49
column 6, line 42 - column 7, line 3
column 7, line 18 - line 26
column 7, line 40 - line 47
column 13, line 24 - line 45
column 14, line 30 - line 58
column 15, line 20 - line 40

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* 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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**Date of the actual completion of the international search**

27 October 2005

**Date of mailing of the international search report**

08/11/2005

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<td>X</td>
<td>WO 98/59282 A (SAMSUNG ELECTRONICS CO., LTD; SAMSUNG INFORMATION SYSTEMS AMERICA) 30 December 1998 (1998-12-30) abstract page 2, line 13 - line 27 page 3, line 8 - line 17 page 3, line 25 - page 4, line 2 page 8, line 10 - line 17 page 9, line 5 - line 22 page 10, line 11 - line 14 page 11, line 3 - line 9 page 13, line 8 - line 11 page 13, line 16 - line 18 page 19, line 23 - page 20, line 14 page 24, line 25 - line 28 page 26, line 3 - line 7 page 26, line 19 - page 27, line 20 page 28, line 10 - page 29, line 9 page 33, line 4 - line 21 claims 24,25; figure 9</td>
<td>1-47</td>
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<tr>
<td>X</td>
<td>EP 1 182 871 A (SONY CORPORATION) 27 February 2002 (2002-02-27) * paragraphs '0009!', '0026!', '0027!', '0030!', '0041!', '0056!' * column 5, line 28 - line 41 figures 1,7</td>
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