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WILSON et al.

(54) CONFIGURING A NETWORK CONNECTION

(76) Inventors: **Terence WILSON**, Alameda, CA (US); **Michael Denis O'CONNOR**, Cary, NC (US)

Correspondence Address:
PATTERSON & SHERIDAN, LLP/CISC
3040 POST OAK BLVD., SUITE 1500
HOUSTON, TX 77056-6582 (US)

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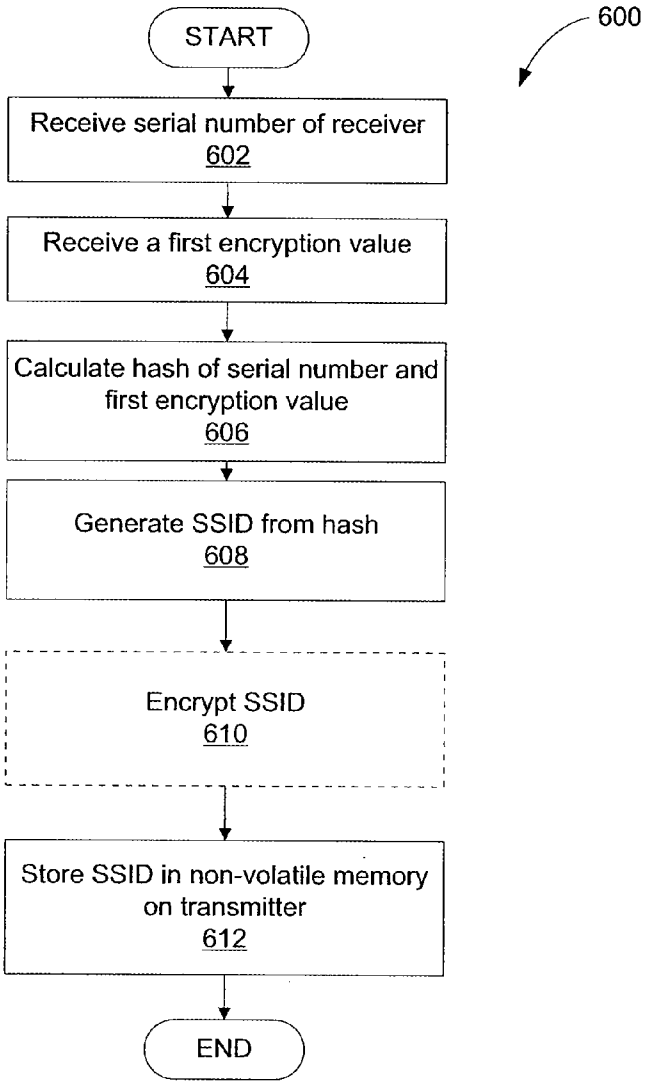
(57) **ABSTRACT**

A communication system for accessing media items via a display device. A receiver is coupled to the display device and a transmitter is coupled to a computer system. Media items stored locally on the computer system and/or remotely on a remote server may be wirelessly transferred from the transmitter to the receiver for display on the display device. In addition, the transmitter and the receiver may be pre-paired prior to delivery to the user, allowing for the network to be configured without any user input. Advantageously, embodiments provide a user with the ability to conveniently view content stored on a computer or a web server without the user having to perform any wireless network setup procedures.



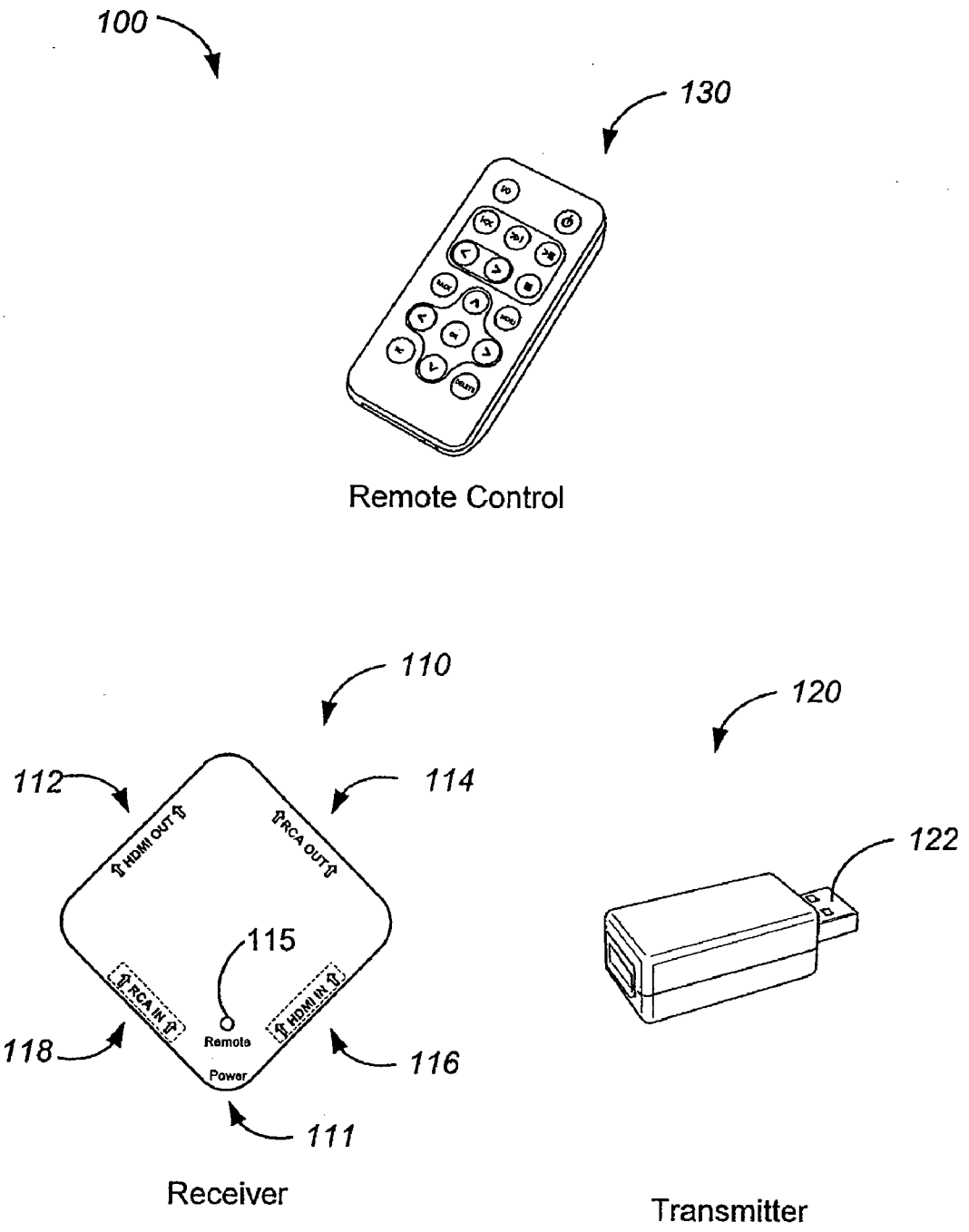

100
130
Remote Control
110
120
112
114
122
HDMI OUT
RCA OUT
115
RCA IN
HDMI IN
Remote
Power
118
116
111
Receiver
Transmitter

FIG. 1

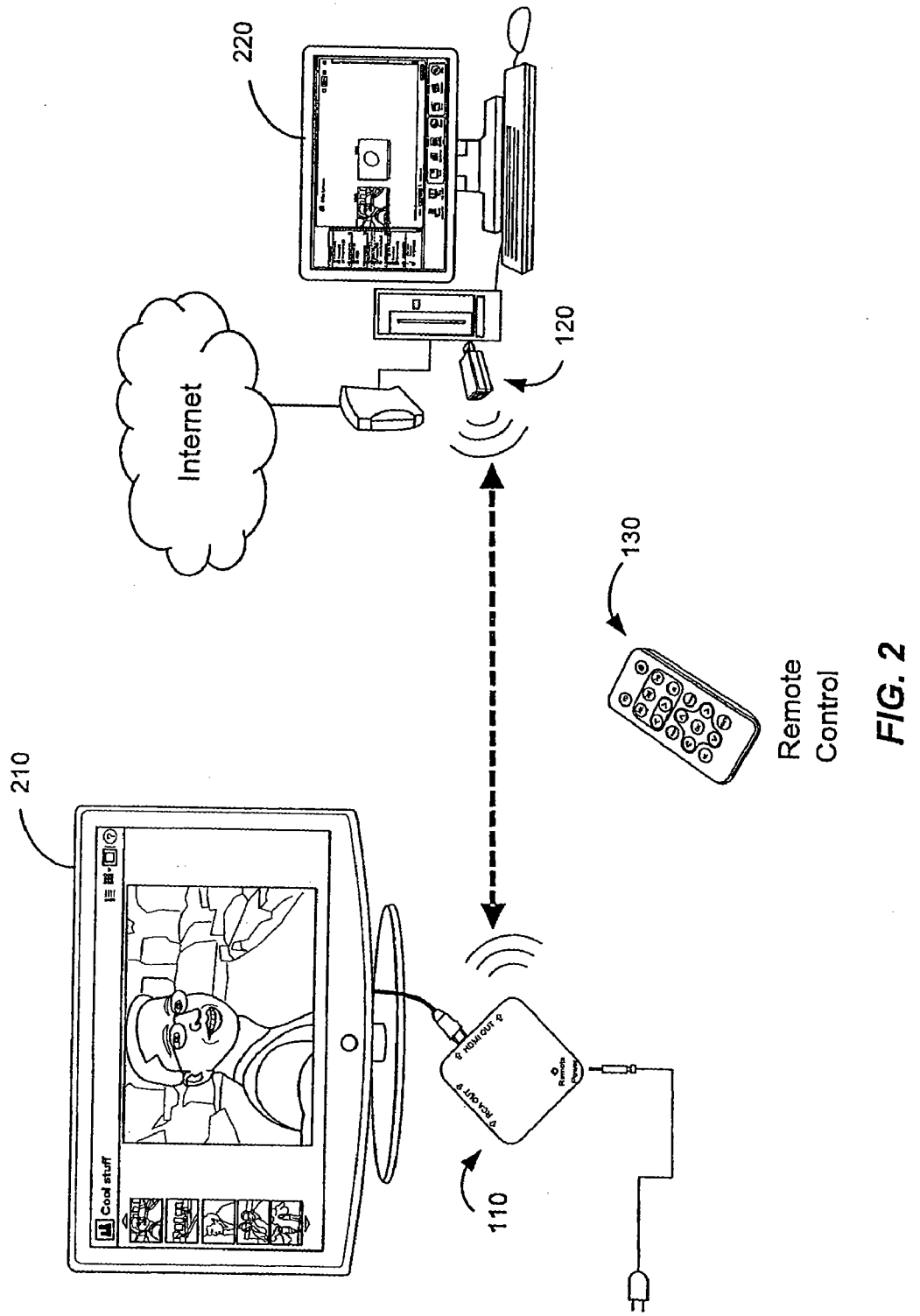

220
120
Internet
130
Remote Control
210
110
Cool stuff
HDMI OUT
RCA OUT
Remote Power

FIG. 2

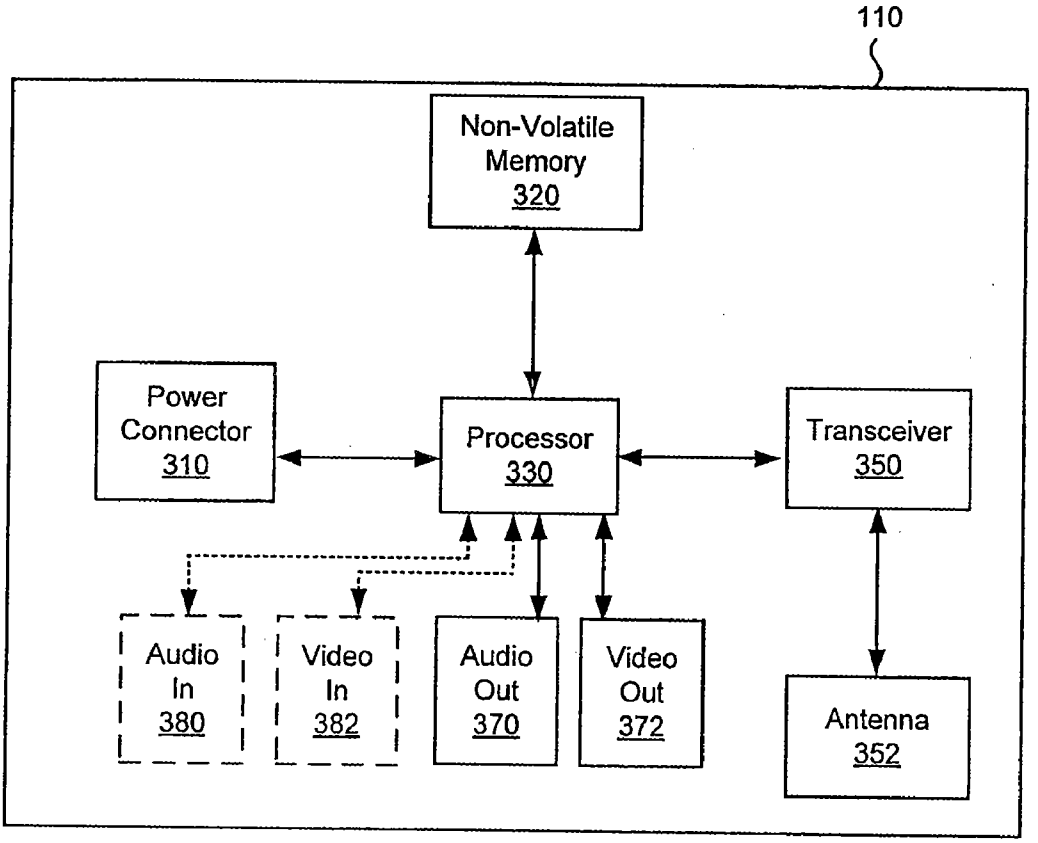

110
Non-Volatile Memory 320
Power Connector 310
Processor 330
Transceiver 350
Audio In 380
Video In 382
Audio Out 370
Video Out 372
Antenna 352

FIG. 3

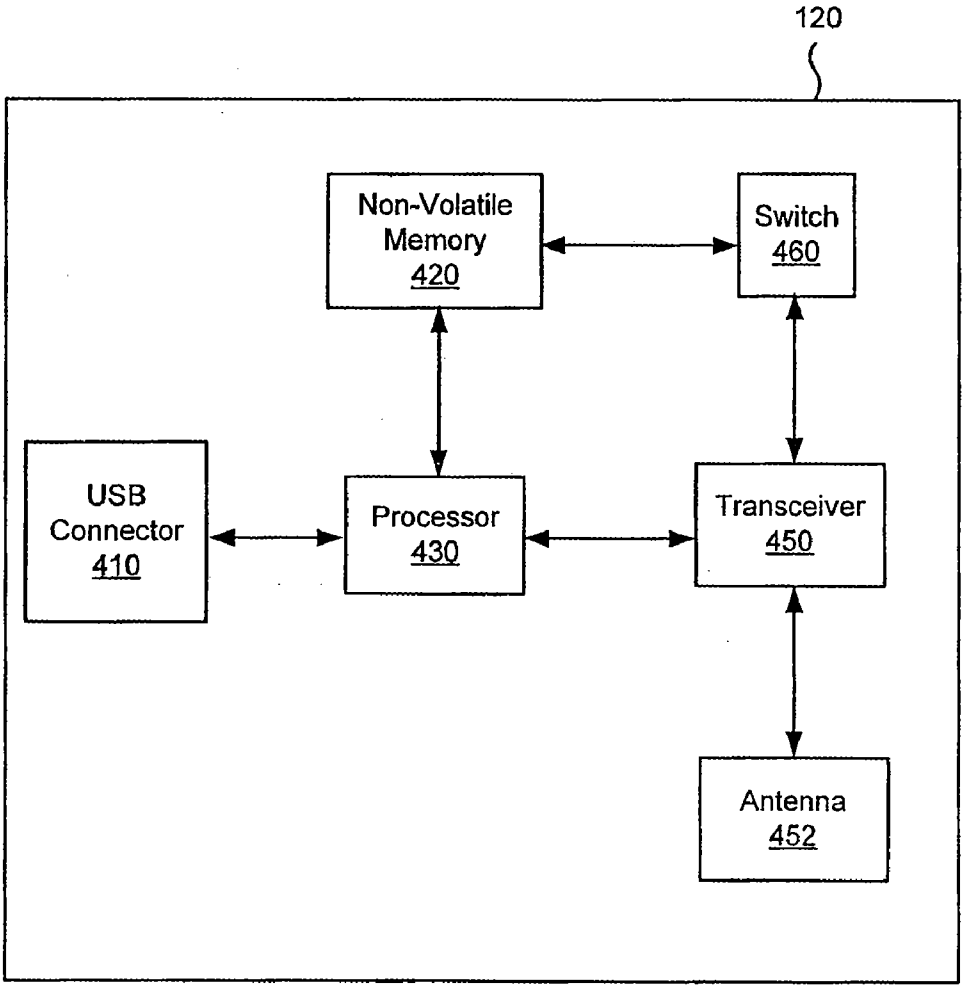

120
Non-Volatile Memory 420
Switch 460
USB Connector 410
Processor 430
Transceiver 450
Antenna 452

FIG. 4

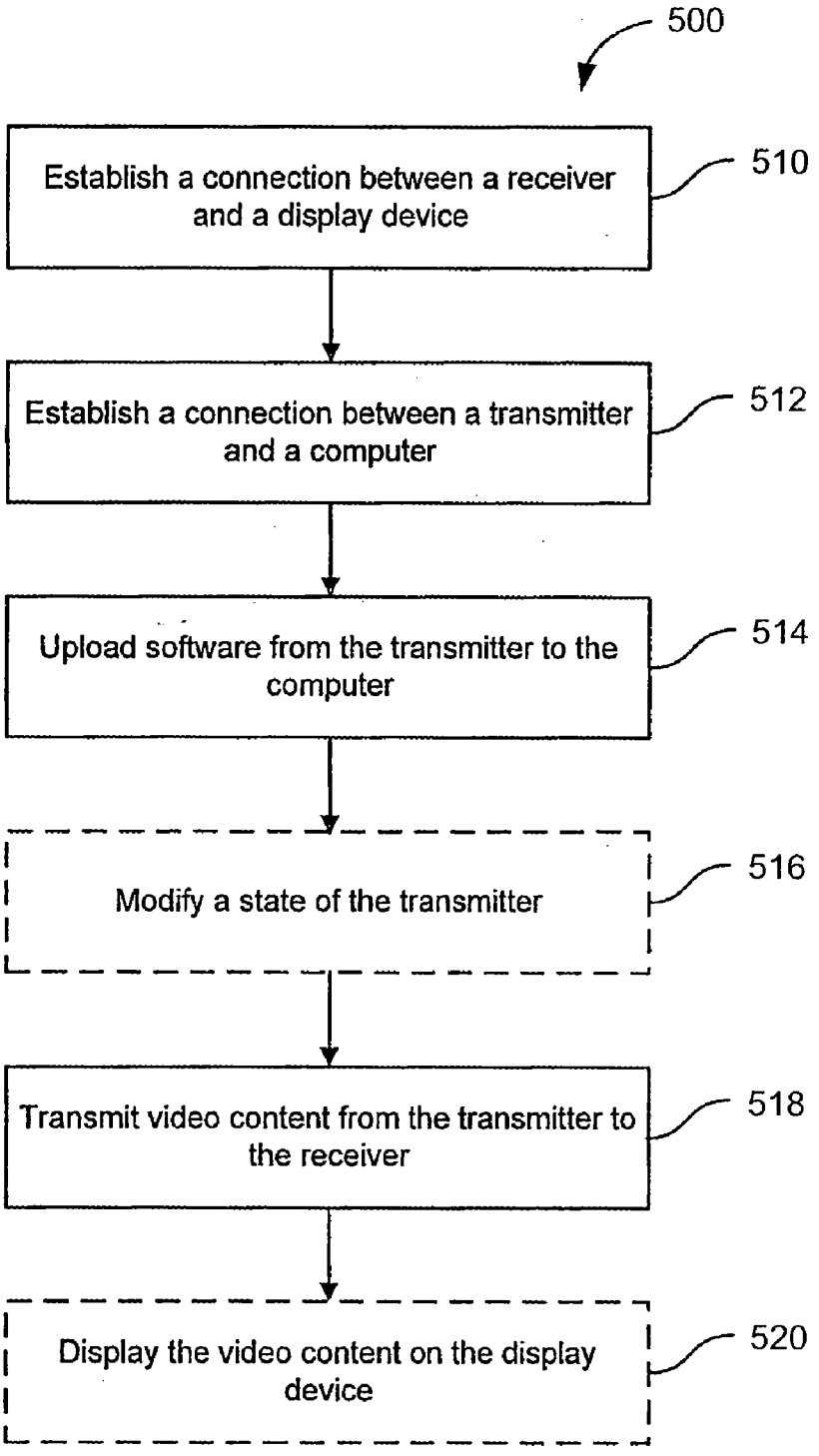

500
Establish a connection between a receiver and a display device
510
Establish a connection between a transmitter and a computer
512
Upload software from the transmitter to the computer
514
Modify a state of the transmitter
516
Transmit video content from the transmitter to the receiver
518
Display the video content on the display device
520

FIG. 5

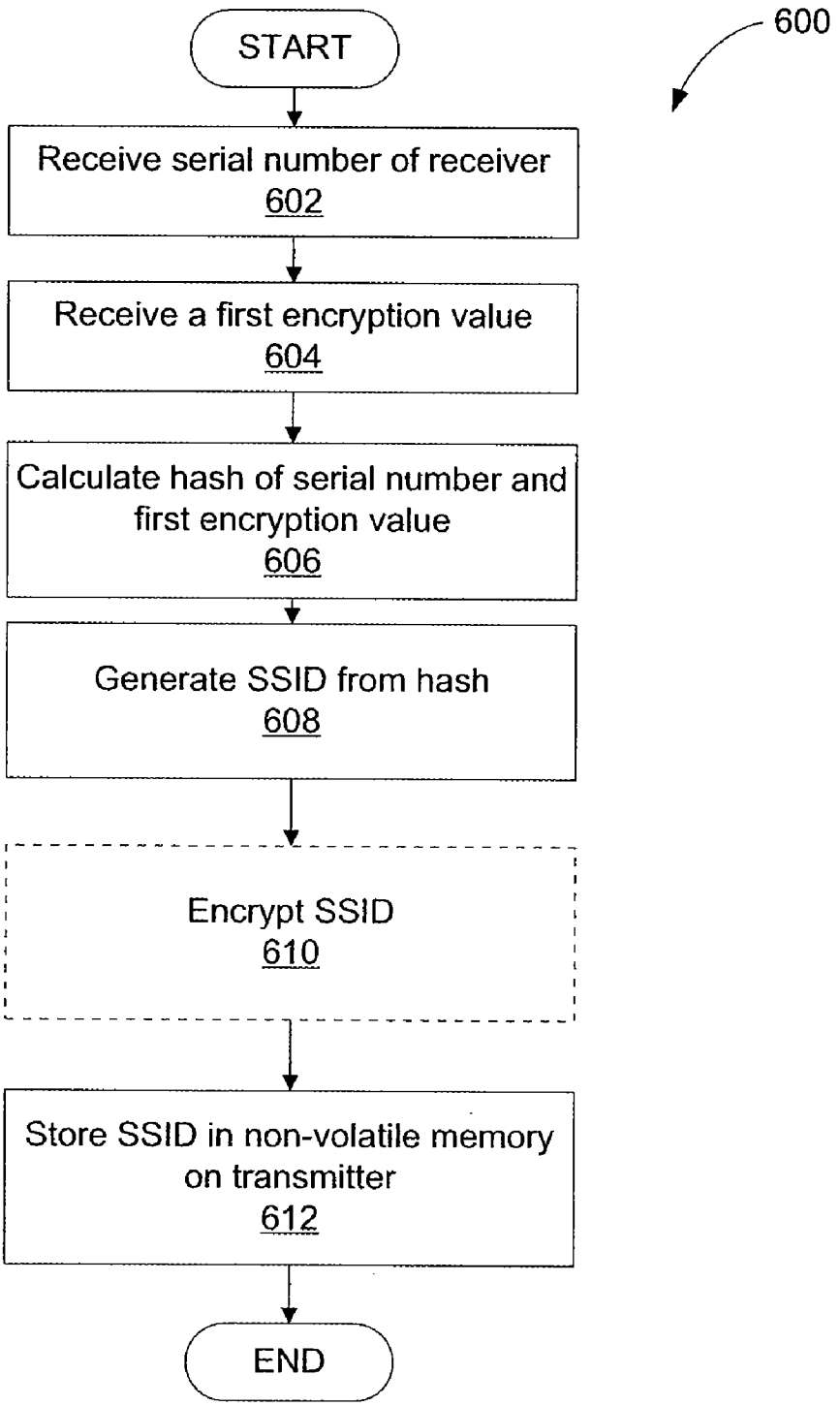

600
START
Receive serial number of receiver
602
Receive a first encryption value
604
Calculate hash of serial number and first encryption value
606
Generate SSID from hash
608
Encrypt SSID
610
Store SSID in non-volatile memory on transmitter
612
END

FIG. 6

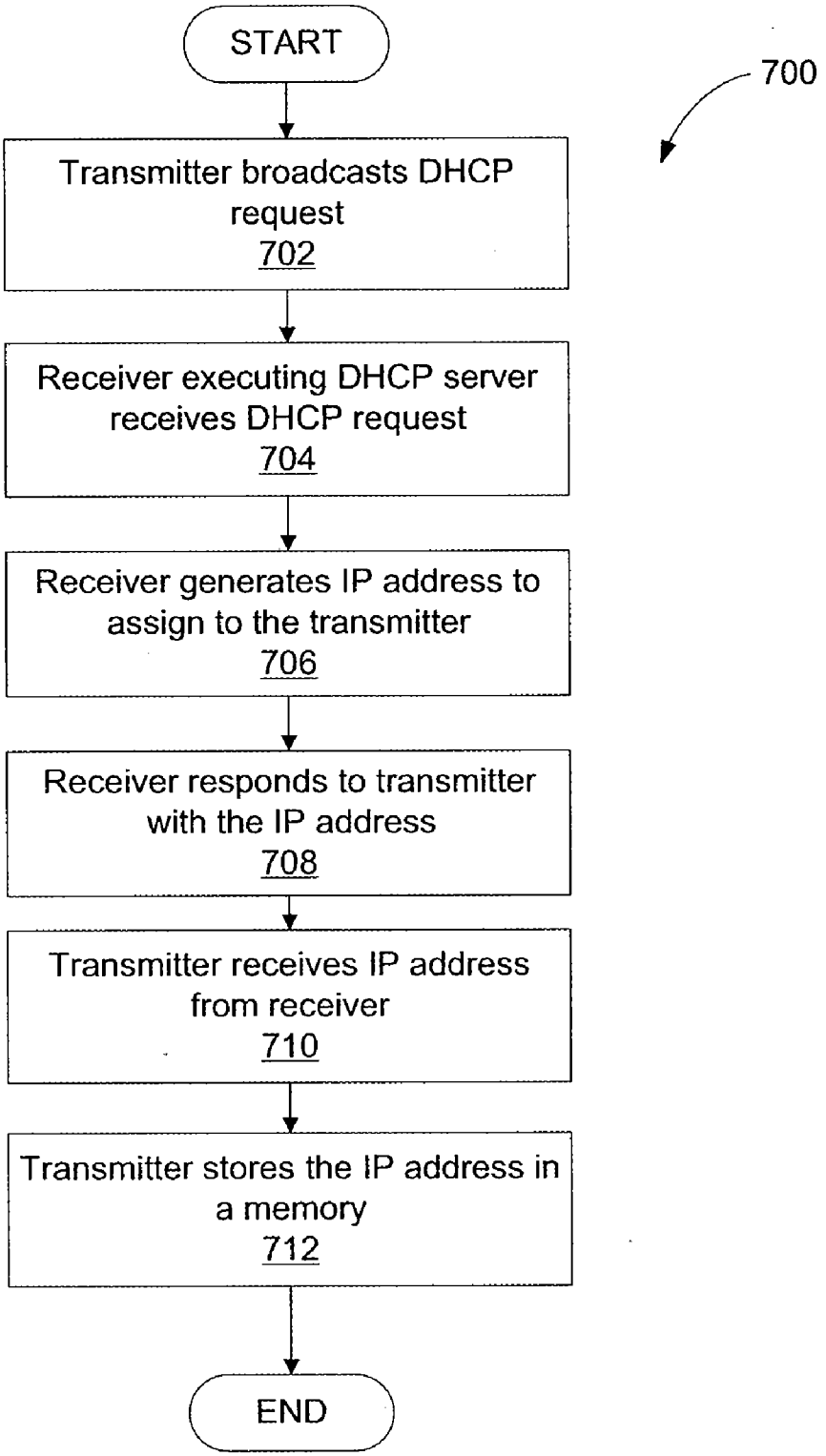

START
700
Transmitter broadcasts DHCP request
702
Receiver executing DHCP server receives DHCP request
704
Receiver generates IP address to assign to the transmitter
706
Receiver responds to transmitter with the IP address
708
Transmitter receives IP address from receiver
710
Transmitter stores the IP address in a memory
712
END

FIG. 7

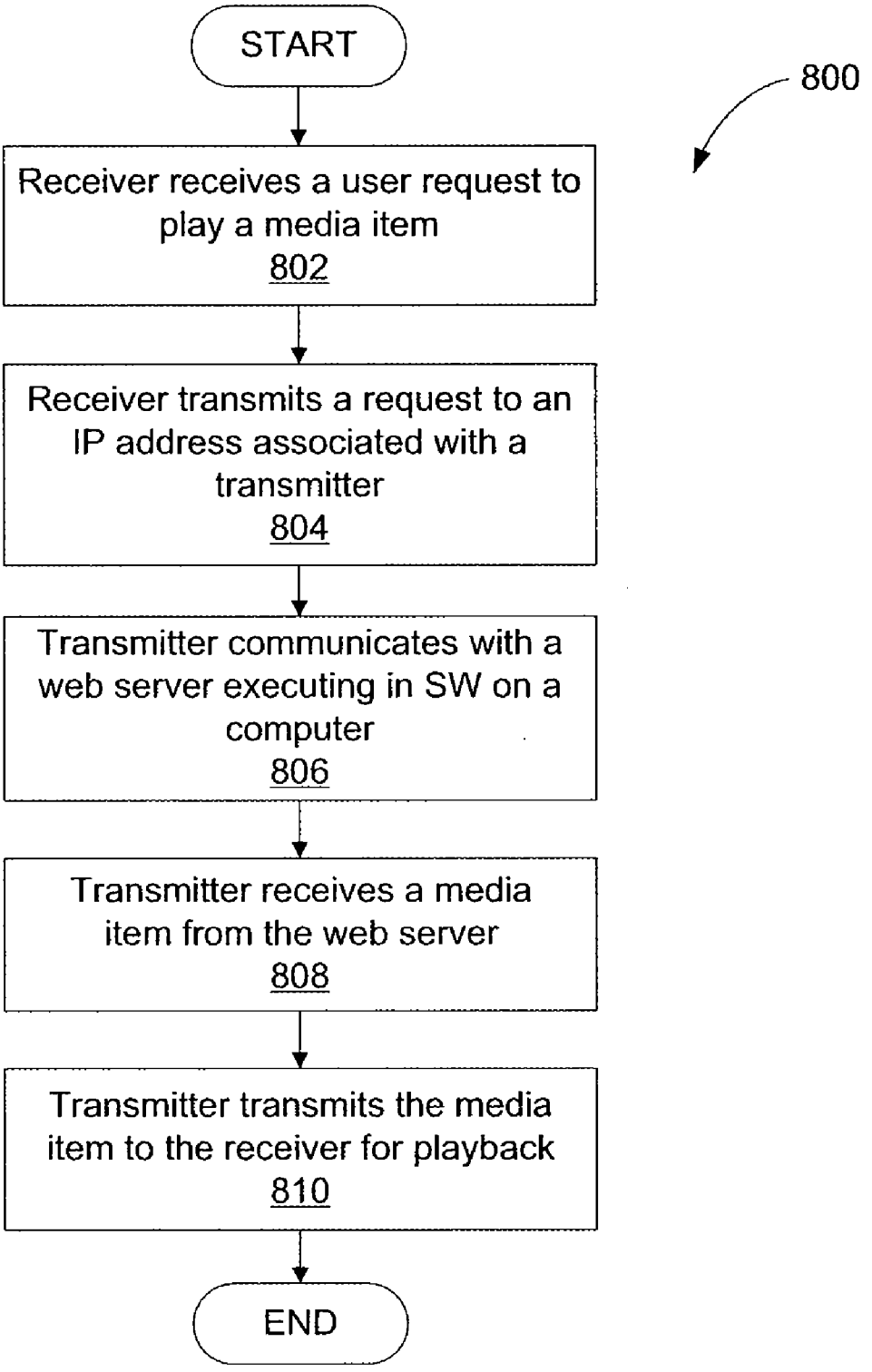

START
800
Receiver receives a user request to play a media item
802
Receiver transmits a request to an IP address associated with a transmitter
804
Transmitter communicates with a web server executing in SW on a computer
806
Transmitter receives a media item from the web server
808
Transmitter transmits the media item to the receiver for playback
810
END

FIG. 8

CONFIGURING A NETWORK CONNECTION

CROSS-REFERENCE TO RELATED APPLICATIONS

[0001] This application claims benefit of U.S. provisional patent application Ser. No. 61/179,688, filed on May 19, 2009, which is hereby incorporated herein by reference.

BACKGROUND OF THE INVENTION

[0002] Digital video cameras enable a user to capture video footage, which can be viewed on a computer or television, uploaded to video sharing websites, or recorded onto a recording medium such as a DVD. Typically, transferring video footage from a digital video camera to an external device such as a television or computer requires the use of a video cable and software to connect the digital video camera to the external device. Some models of digital video cameras provide a built-in Universal Serial Bus (USB) connector to facilitate transfer of video footage from/to the digital video camera and the external device. In order to view video footage on a television, a user typically uses a cable (e.g., a cable with both video and audio connectors) to connect the digital video camera to the inputs of the television, and then uses a user interface on the digital video camera to initiate and control the playback of the video footage displayed on the television. Some digital video cameras also utilize a remote control to supplement or replace the user interface on the digital video camera during playback to the television. This method of viewing video footage on a television presents several difficulties, including either using the batteries in the digital video camera or providing external power to the digital video camera during playback, positioning of the digital video camera close to the television while the user is typically sitting farther from the television during video playback, and the like.

[0003] If the user has already downloaded the video content recorded on the digital video camera to a computer, the video content can be viewed on the computer display. However, many users prefer to watch video footage on a television, which is typically located at a distance (e.g., in a separate room) from the computer. One approach is to use the computer to burn a digital versatile disc (DVD) including the video content. However, burning a DVD is a complicated operation for some users and requires use of DVD media. Additionally, DVDs have limits on the length of videos that can be stored on the DVD, typically one or two hours of video. Thus, for video footage of longer durations, multiple DVDs are typically required. Another approach is to transmit the video footage from the computer to the television. 802.11-based media extenders have been developed for this purpose. Using 802.11-based wireless networks is a challenging endeavor for many users. Setting up the network is a complicated process that many users find difficult and frustrating, including issues related to firewalls, port forwarding, dynamic Domain Name System (DNS), etc. The challenges of setting up and operating 802.11-based networks is a contributing factor to the high return rate of wireless networking equipment.

[0004] Despite the capabilities of currently available systems, the viewing experience of digital video for many users is less than desirable. Thus, there is a need in the art for improved methods and systems for viewing video footage on a display device.

SUMMARY

[0005] One embodiment of the invention provides a method for generating network parameters for a communications system. The method includes calculating a hash value based on a unique identifier associated with a receiver device and a first encryption value, where the communications system includes a transmitter device configured to perform two-way wireless communications with the receiver device; generating one or more network parameters for use in establishing a network connection between the transmitter device and the receiver device within the communications system based on the hash value; and storing the one or more network parameters in a non-volatile memory included in the transmitter device.

[0006] Another embodiment of the invention provides a system for establishing a network connection. The system includes a transmitter device coupled to a first computer system and a receiver device. The receiver device is configured to receive a DHCP (Dynamic Host Configuration Protocol) request broadcast by the transmitter device, assign an IP (Internet Protocol) address to the transmitter device from a list of available IP addresses, and establish the network connection between the transmitter device and the receiver device based on the IP address.

[0007] Many benefits are achieved by way of embodiments of the present invention over conventional techniques. For example, embodiments of the present invention provide an enhanced user experience in comparison with conventional wireless communications networks. Additionally, embodiments provide a user with the ability to conveniently view video footage stored on a computer or a web server on a television without having to perform any wireless network setup procedures. As an example, embodiments of the present invention provide a simple and reliable way for viewing videos, movies, photos, and other media on a home television. Utilizing the embodiments described herein, consumers can effectively bring their multimedia content onto their primary viewing device (i.e., the TV) and enjoy this media in a comfortable setting such as a living room. These and other embodiments of the invention along with many of its advantages and features are described in more detail in conjunction with the text below and attached figures.

BRIEF DESCRIPTION OF THE DRAWINGS

[0008] FIG. **1** is a simplified illustration of elements of a communications system, according to an embodiment of the present invention;

[0009] FIG. **2** is a simplified illustration of an exemplary use of the communications system, according to an embodiment of the present invention;

[0010] FIG. **3** is a simplified schematic diagram of a receiver, according to an embodiment of the present invention;

[0011] FIG. **4** is a simplified schematic diagram of a transmitter, according to an embodiment of the present invention;

[0012] FIG. **5** is a flow diagram of method steps for operating a communications system, according to an embodiment of the present invention.

[0013] FIG. **6** is a flow diagram of method steps for generating network parameters, according to an embodiment of the present invention.

[0014] FIG. **7** is a flow diagram of method steps for establishing a network connection between a transmitter and a receiver, according to an embodiment of the present invention.

[0015] FIG. **8** is a flow diagram of method steps for transmitting data between a transmitter and a receiver, according to an embodiment of the present invention.

DESCRIPTION OF EXAMPLE EMBODIMENTS

[0016] Embodiments of the present invention relate to transmitting video footage from a source to a display device. Merely by way of example, embodiments of the invention are applied to a communications system including a transmitter coupled to a computer and a receiver coupled to any type of display device, such as a television, a monitor, or any other type of display device. The methods and techniques can be applied to video footage stored on a web server, a local machine, a remote machine, and the like.

[0017] According to an embodiment of the present invention, a system for transmitting video content from a computer to a display device is provided. The system includes a receiver operable to communicate with the display device. The receiver includes a first wireless transceiver, a video output, and an audio output. The system also includes a transmitter operable to communicate with the computer. The transmitter also includes a wireless transceiver. The receiver and the transmitter are operable to perform two-way wireless communication with each other.

[0018] According to yet another embodiment of the present invention, a method of transmitting video content is provided. The method includes establishing a connection between a receiver and a display device. The receiver includes a first wireless transceiver, a video output, and an audio output. The method also includes establishing a connection between a transmitter and a computer. The transmitter includes a second wireless transceiver and memory and the transmitter is operable to operate in a first mode and a second mode. The method further includes uploading software from the memory of the transmitter to the computer while operating in the first mode and transmitting the video content from the transmitter to the receiver while operating in the second mode.

System Overview

[0019] FIG. **1** is a simplified illustration of elements of a communications system **100**, according to an embodiment of the present invention. The communications system **100** includes a receiver **110** operable to communicate with a display device. The receiver **110**, which may be a transceiver, includes the ability to both transmit and to receive data from a matched transceiver (i.e., transmitter **120**). Because receiving data for display on the display device is the primary function of the receiver **110**, it is referred to as a receiver, despite the fact that in some embodiments the receiver **110** includes the functionality of transmitting data as well. In one embodiment, the receiver **110** includes a wireless transceiver **350** as illustrated in FIG. **3**. The receiver **110** also includes one or more video outputs and one or more audio outputs as described more fully below. As shown in FIG. **1**, the receiver includes a High-Definition Multimedia Interface (HDMI) output **112** that carries both audio and video signals, as well as RCA outputs **114**, including separate output ports for composite video and stereo audio (left and right). In another embodiment, component video outputs may be provided as appropriate to the particular application. Preferably, the RCA audio outputs will be active concurrently with the HDMI output so that the RCA audio outputs can be used in parallel with the HDMI output. The receiver includes a power port **111** to receive power from a power source and to power the various components of the receiver **110**.

[0020] The communications system **100** also includes a transmitter **120**. The transmitter **120**, which may also be a transceiver, includes the ability to both transmit and receive data from a matched transceiver (i.e., receiver **110**). Because transmitting data for subsequent display on the display device is, in some embodiments, the primary function of the transmitter **120**, the transmitter **120** is referred to as a "transmitter," despite the fact that the transmitter **120** includes the functionality of receiving data as well. In a particular embodiment, the transmitter **120** is a dongle including a connector **122** compliant with the Universal Serial Bus (USB) standard and operable to be inserted into a USB port of a computer, for example, a personal computer. As described in greater detail in FIG. **4**, the transmitter **120** includes a wireless transceiver **450** that is operable to transmit data from the computer to the receiver **110**. For example, the data may include video and audio data for display on the display device.

[0021] According to embodiments of the present invention, the receiver **110** and the transmitter **120** are pre-paired during the manufacturing process. Thus, when a user first sets up the communications systems, there is no need for the user to pair or define settings associated with the communication that occurs between the receiver **110** and the transmitter **120**. This embodiment contrasts with conventional wireless networking equipment, for which a user typically needs to manually pair the various devices prior to use. As an example, in a conventional 802.11-based network, a user needs to set the Service Set Identifier (SSID), password, and/or other network parameters that enable the various network elements to communicate. In the embodiments described herein, such settings are pre-set at the time of manufacturing as part of the manufacturing process or at other time prior to delivery to the user. Thus, when the user first installs the equipment, the parameters necessary for two-way communications between the receiver **110** and the transmitter **120** are already set. As a result, the user is provided with a fully functioning communications system straight "out-of-the-box."

[0022] In some embodiments, the communications system **100** may also include a remote control **130**. The remote control is operable to communicate with receiver **110** and may be used to control the playback of video footage on the display device. Like the transmitter **120**, the remote control **130** is also pre-paired with the receiver **110** prior to delivery to the user. In some embodiments, the remote control **130** is also able to control operation of the transmitter **120**, although this feature is not required by embodiments of the present invention. As described in more detail in FIG. **2**, the receiver **110**, transmitter **120**, and/or the remote control **130** provide a system used to view video footage stored in various manners, such as on a computer, stored on a remote site such as a web server, or the like.

[0023] The remote control **130** includes user input buttons including play, pause, fast forward, rewind, next track, previous track, volume up, volume down, mute, and the like. Other functionality as appropriate to the particular embodi-

ment can be implemented in the remote control **130** as needed. For example, a "favorites" button may be provided that allows a user to mark a particular media item as a favorite. A signal is transmitted from the remote control **130** to the receiver **110** that indicates that a selected media item should be marked as a favorite. The receiver **110**, then, transmits a signal to the transmitter **120** indicating that the selected media item should be marked as a favorite. The transmitter **120**, in turn, conveys this information to the software executing on the computer **220** by sending a signal to the computer **220**. The software executing on the computer **220** updates the metadata associated with a local copy of the selected media item to indicate that the selected media item should be marked as a favorite. If the selected media item is also stored on a remote server and is being accessed remotely, then metadata associated with the copy of the media item stored on the remote server is updated as well. As another example, another button may be provided on the remote control **130** that allows a user to mark a selected media item to be transmitted to a particular person or stored on a remote server. One of ordinary skill in the art would recognize many variations, modifications, and alternatives.

[0024] FIG. **2** is a simplified illustration of an exemplary use of the communications system, according to an embodiment of the present invention. As shown, the receiver **110** is connected to display device **210**, for example, a television or other video display monitor. The embodiment illustrated in FIG. **2** utilizes an HDMI cable carrying both audio and video data from the receiver **110** to the display device **210**. In one embodiment, in order to view content received by the receiver **110**, the user may select an input on the display device **210** corresponding to the input connector to which the HDMI cable or other cable(s) is connected. In another embodiment, composite video and stereo audio RCA outputs, component video outputs, analog audio/visual outputs, or the like are utilized. In one embodiment, the receiver **110** communicates with the transmitter **120** as a dedicated solution. One of the benefits provided by embodiments of the present invention is that the various components of communications system **100** can be configured to not interact with other, non-system components and devices. In a typical use case of an embodiment of the invention, there may be additional wireless devices in the proximity of communication system **100**. However, embodiments of the present invention provide a "walled garden" approach in which no configuration actions on the part of the user are needed. Because the receiver **110**, the transmitter **120**, and/or the remote control **130** are pre-paired prior to shipment from the manufacturer and/or delivery to the user, the user does not need to configure these devices and the user experience is more streamlined—the user just plugs-in the devices and they operate as intended. As an example, the receiver **110** is coupled to a television using an HDMI cable, the transmitter **120** is inserted into the USB port of a computer containing video files, and with no wireless setup actions, the user is able to watch the videos on the television. This contrasts sharply with conventional wireless networking system setup procedures.

[0025] Target customers for the products described herein include owners of digital video cameras. As described more fully in relation to FIG. **4**, the transmitter **120** may includes software that is configured to access video footage stored on a computer or on a web server accessible through the Internet. In some embodiments, when the transmitter **120** is plugged into the computer for the first time, the software may be uploaded to and installed on the computer (automatically in some embodiments). Using the installed software, the user is able to access video footage or other media stored on the computer, transmit the media to the receiver **110**, and view and/or listen to the media on the display device **210**. In other embodiments, a user is able to download the appropriate software from the Internet.

[0026] The ease of installation and use enables users that are not particularly technology savvy to enjoy the benefits of more widely present video footage. As an example, it may be desirable to share videos on a user's computer with a family member without a digital video camera or a wireless network, but with a television, a computer, and an Internet connection. The family member purchases a system as described herein, couples the receiver **110** to the television and couples the transmitter **120** to the computer. After the installation of software resident on the transmitter, typically only requiring an acceptance of a click-through license agreement by the family member, the family member is able to receive videos from the user and then watch them on their television. In other implementations, a user account may be created or other setup procedures may be performed. Other content that is downloaded to the computer can also be viewed on the television, which is typically a more comfortable viewing environment than the computer, using the communications system described herein. It should be noted that various methods for identifying the receiver **110** as a network element may be used, as described in greater detail herein.

[0027] Embodiments of the present invention provide for a variety of sources of media for viewing using communications system **100**. As an example, videos may be stored on the computer or on a web server accessible through the Internet. Additionally, in some embodiments, a user is able to define one or more channels and associate other users with these channels. Video content is then shared using these channels to the associated users.

[0028] Although the system illustrated in FIG. **2** includes receiver **110**, other embodiments replace the receiver **110** with a router that is operable to communicate with the transmitter **120**. The router can serve other functions than delivering content to the display device, for example, other wireless communications functions. The router in this embodiment is operable to interact with not only the transmitter but the software resident on the computer.

[0029] In still further embodiments, the receiver **110** may be replaced by any device that would typically be plugged into a computer and would typically require a driver, such as a computer peripheral (e.g., a printer or a scanner), among others. For example, a transmitter **120** (i.e., a dongle) may be provided that is configured to communicate with one or more of other devices. One or more drivers and/or software for the other devices may be stored in a mass storage portion of the transmitter **120**. When the transmitter **120** is plugged-in to the computer, the transmitter **120** is detected as a mass storage device and the drivers and/or software stored in the mass storage portion may be automatically installed on the computer, as described herein. Once the drivers and/or software are installed and executed on the computer, the drivers and/or software may transmit a signal to the transmitter **120** (i.e., to the dongle) indicating to the transmitter **120** to switch from mass storage device mode to wireless mode. Again, the transmitter **120** may be configured to communicate with a single device or with multiple devices of the same or different types. One advantage of these embodiments is that manufacturing

costs are reduced since a CD (compact disc) or DVD (digital versatile disc) that includes the drivers and/or software does not need to be shipped or sold with the transmitter **120**. A second advantage is ease of installation, since no user input is required to install and configure the device.

[0030] Referring once again to the embodiment shown in FIG. **2**, the display device **210** may show a user interface generated either by the receiver **110**, the transmitter **120**, the computer **220**, or some combination thereof. As an example, the user interface displayed could be a version of software executing on the computer **220** modified for display on a television. Depending on the particular implementation, the processing load for generating the user interface and processing of the video signal may be distributed between the receiver **110** and/or the combination of the transmitter **120** and/or computer **220**. Since the computer typically has significant computing resources available, a specific embodiment utilizes the computer **220** to perform the vast majority of processing, merely relying on the receiver **110** to receive and display the received data. In this specific embodiment, the computer renders the information to be displayed as the user interface, the computer renders video footage at 30 frames per second (or another appropriate frame rate) that is broadcast to the television, and the like. Since a broadcast-ready video signal is transmitted to the receiver in this embodiment, the receiver only needs to pass this video signal through to the display device, greatly reducing the processing load on the receiver **110**.

[0031] In another embodiment, at the other end of the processing spectrum, much of the processing may be performed in the receiver **110**. In this alternative embodiment, the receiver **110** may have significant computing resources. Video processing, buffering, storage, and the like may be performed in the receiver. Other embodiments also fall at other points along the spectrum, dividing the processing tasks between the computer **220**, the transmitter **120**, and the receiver **110**.

[0032] As an example use case, a user uses remote control **130** to control the receiver **110**. The user interface is displayed on the display device **210** and two-way communication is established between the receiver **110** and the transmitter **120**. Requests from the user may pass from the remote control **130** to the receiver **110**, through the wireless connection to the transmitter **120**, and then from the transmitter **120** to the computer **220**. For an application executing on the computer **220**, information related to the available videos (i.e., metadata) may be transmitted from the transmitter **120** to the receiver **110** and displayed on the display device **210**. Using the remote control **130**, the user may select a video to be played and the selected video footage may be transmitted from the computer **220** through the transmitter **120** to the receiver **110** and then displayed on the display device **210**.

[0033] In various embodiments, metadata associated with the video content stored on the computer **220** or on the Internet is available to the system and can be used to sort, categorize, or otherwise manage the video content. As an example, if a particular video is marked as a favorite, given a name, placed in one or more particular folders, or the like, this information may be available to the user through the user interface displayed on the display device **210**. The availability of this metadata contrasts with conventional media extenders in which only video content is available. Additionally, since embodiments of the present invention provide custom software solutions, the methods and systems described herein make available proprietary features such as user-defined channels that are not available using conventional techniques.

[0034] In one embodiment, the user interface displayed on the display device **210** is simple to use and requires little or no training. Some embodiments provide for customization of the user interface although this is not required by embodiments of the present invention. As an example, keyboard shortcuts could be included, although not used by all users. Additionally, in some embodiments, changes made by a user interacting with the software executing on the computer **220** may be reflected in the user interface displayed to the user on the display device **210**. For example, one or more media items may be marked as "favorites" or "new." Media items that are marked as new, in some embodiments, include those media items that have not yet been viewed.

[0035] In some embodiments, the communications channel between the transmitter **120** and the receiver **110** is provided in accordance with commercially available wireless communications standards. For example, using the IEEE 802.11n wireless standard, bandwidth suitable for high definition (HD) videos (e.g., 10 megabits per second) is provided. Other wireless standards providing suitable bandwidth can also be utilized. One of ordinary skill in the art would recognize many variations, modifications, and alternatives. For example, the bandwidth of the connection between the transmitter **120** and the receiver **110** may be limited to a predefined level when the content being transmitted over the communication channel is being transmitted from a remote server, e.g., 1 megabits per second. The predefined level, in some embodiments, may be configurable by the user.

[0036] In some implementations, the bandwidth of the communications channel can be conserved by performing some video processing at the receiver **110**. For example, if video content is stored on the computer **220** at a resolution of 480p, up-scaling could be performed on the receiver **110** to provide a 720p signal for display on the display device **210** (e.g., the television). A benefit of using an HDMI connector to couple the receiver **110** and the display device **210** is that the television is able to scale video content received over an HDMI connection to a scale appropriate for the particular television. For example, if the television can display 1080p video content and the content provided by the HDMI connection is 720p, then the television can upscale the content to 1080p for display.

[0037] Embodiments of the present invention provide for personalization of content provided in channels the user has established. For example, if a channel is associated with a hockey team of a user, the display on the display device **210** could be personalized with hockey-related themes or the like. The background of the user interface, generated either at the computer **220** or the receiver **110**, could be hockey-based. More sophisticated environments and attributes related to hockey could also be provided, such as news or information feeds. One of ordinary skill in the art would recognize many variations, modifications, and alternatives.

[0038] According to embodiments of the present invention, the connection between the remote control **130** and the receiver **110** is a radio frequency (RF) connection so that line-of-sight is not required between the remote control **130** and the receiver **110**. This feature enables the receiver **110** to be placed at a location behind other components, for example, at the back of an entertainment center in a user's home. Thus, the receiver **110** does not have to be a "front row" device, competing for shelf space with other audio-visual system

components. In addition to non line-of-sight communications, the range for RF connections is typically greater than that available with infrared connections. The RF nature of the remote control **130** allows the remote control to also be used in conjunction with the transmitter **120**, which may be coupled to a computer **220** that is not located in the room with the receiver **110** and display device **210**. In an alternative embodiment, the remote control operates using infrared technology.

[0039] The pre-pairing of the remote control with the receiver also solves potential problems with cross-talk between adjacent systems. As an example, if a user is installing communications system **100** in an apartment complex in which another user has already installed a similar communications system, it would be undesirable to have one user's remote control controlling another user's receiver. The pre-pairing of the remote control and receiver during manufacturing prevents this undesirable cross-talk, thereby enhancing the user experience.

[0040] In one embodiment, the receiver is configured to operate in a "pass-through" mode. In the pass-through mode, the receiver is installed between another user device (e.g., a set-top box, a DVD player, or the like) and the display device (e.g., a television). The signal from the user device passes through the receiver during normal operation of the user device. However, when the receiver begins to receive data from the transmitter, a switch in the receiver switches the video path from the user device to the transmitter. In another embodiment, when the receiver is powered on, the receiver could switch the video path. In yet another embodiment, the switch includes a sensor responsive to incoming video signals and switches to the active video signal, with priority being given to video from the transmitter. In these embodiments, the user does not need to switch the input on the display device in order to view content received by the receiver. Referring to FIG. **1**, an optional pass-through HDMI input **116** and optional pass-through RCA inputs **118** are illustrated. In other embodiments, these optional inputs are not utilized and data is received at the receiver using only the wireless connection to the transmitter.

[0041] In addition to switching from one video input to another video input in the pass-through configuration, overlay technologies are included within the scope of the present invention. Using these overlay technologies, a signal from a set-top box or other user device could be provided to the television, but overlaid with a signal from the transmitter. Typically, the overlaying of the signal would be performed using a processor in the receiver and would not involve processing of the video signal received from the set-top box, but merely overlaying of an additional signal. As an example, if a new video is available for viewing, a logo could be displayed on the television, overlaid on the video signal from the set-top box, indicating the availability of the new video. One of ordinary skill in the art would recognize many variations, modifications, and alternatives.

[0042] According to some embodiments of the present invention, status indicators **115** are provided on the receiver, through the user interface, or combinations thereof. As an example, LED status indicators **115** are illustrated on the receiver in FIG. **1** and may be used to indicate lack of connection to a paired device (e.g., a transmitter or remote control), presence of connection, but at a data rate unsuitable for video signals or certain types of video signals (e.g., HD signals), or the presence of a suitable connection, among others. Additional status indicators could be provided on the transmitter indicating similar or other characteristics. Moreover, status indicators could be provided through software on the computer, delivered to the user through the user interface.

[0043] It should be noted that communications both downstream (i.e., transmitter to receiver) and upstream (i.e., receiver to transmitter) are provided by embodiments of the present invention. In addition to control commands transmitted from the remote control to the receiver and then to the transmitter, status information is also transmitted upstream, providing the user with enhanced control in comparison with conventional systems.

[0044] Utilizing the system illustrated in FIG. **2**, users can enjoy multimedia content after minimal setup requiring little technical know-how. The system includes one or more of the following features and benefits: (1) no cables between the TV and the computer; (2) no need for wireless network setup or configuration by the user; (3) no complex software installation or online setup; (4) no long delays, video download, or general "wait time;" and/or (5) completely secure (e.g., no one else can view personal videos). Once the system is operational, in some embodiments, the user can access some or all of the videos, movies, and/or photos stored on their computer, as well as online content accessible through the Internet. Using the remote control, users can easily play back videos on their TV as well as potentially interact with the computer, opening up many possibilities for future features and services.

[0045] The system illustrated in FIG. **2** can be characterized by a number of technical specifications. The following specifications are not intended to limit the scope of embodiments of the present invention but merely to provide an example of system specifications for a particular embodiment. Specifications for the overall system are provided in Table 1, specifications for the receiver are provided in Table 2, specifications for the transmitter are provided in Table 3, and specifications for the remote control are provided in Table 4.

TABLE 1

Feature	Specification
Wireless Range	Up to 200 ft with clear line of sight with up to 50 ft reduction per wall (construction material dependent)
Wireless Bandwidth	12 Mbits/sec
Wireless Security	Proprietary streams; No access to computer through transmitter
Wireless Interference	Compliance with FCC and WiFi requirements
Pairing	Pre-pairing of receiver, transmitter, and remote control as a component of the manufacturing process
Response Durations	No longer than 3 seconds of latency for starting playback on the display device; Minimal latency for selection/navigation, preferably less than 1/10th of a second; Pause and continue playing - nearly instantaneous; Skip next/previous - up to 3 seconds; Enter new folder (populate one screen's worth of thumbnails) - nearly instantaneous; Display a screen's worth of folder names -- nearly instantaneous; Boot time for receiver - up to 10 seconds; Initial sync or re-sync between transmitter and receiver - nearly instantaneous feedback that syncing is underway, syncing complete within 5 seconds.
Localization	Country specific
Co-existence	Multiple systems can co-exist within range of each other; no cross-talk between systems

TABLE 1-continued

Feature	Specification
Updates	Software and firmware update process similar to Flip camcorder products; Receiver updates are sent remotely via wireless connection; Remote control and transmitter are not anticipated to require firmware upgrades
Video Pass-through	Overlay of graphics on video passed through receiver; Notification of newly arrived videos
Video Controls	Play; Pause; Fast Forward; Rewind; Skip next/previous
Out-of-the-box user experience	Components can be connected in any order; On-screen guide (PC or TV) to assist with setup and/or troubleshooting; Signal strength indicator on receiver and/or shown graphically as a signal meter on the TV and/or PC as part of setup and troubleshooting

TABLE 2

Feature	Specification
Inputs	Optional HDMI; Optional RCA Composite Video + Stereo Audio; Power
Outputs	HDMI; RCA Composite Video + Stereo Audio; Optional DVI
Optional Pass-through	RCA Composite Video + Stereo Audio pass-through; HDMI pass-through; Pass-through functionality is active when receiver is not in use
Display Resolution	NTSC: 720 × 480 interlaced, 30 fps; PAL: 720 × 576 interlaced, 25 fps; HDMI (US): 1280 × 720 progressive, 30 fps; HDMI (EU): 1280 × 720 progressive, 25 fps
TV Standards	NTSC; PAL
Status LED(s)	OK (Wireless connection; Acceptable bandwidth); Reduced Bandwidth; (Wireless connection; Bandwidth lower than specification); No connection (No wireless connection); Power indicator
File Format	640 × 480, 30 fps MPEG-4 AVI; 640 × 480, 30 fps
Playback Compatibility	MPEG-4 AVI; 1280 × 720, 30 fps H.264 MP4; 640 × 480, 30 fps H.264 MP4; 480 × 360 H.264 MP4; 480 × 270 H.264 MP4; 1280 × 720, 30 fps H.264 MP4; 640 × 480, 30 fps H.264 MP4
Boot Time	Less than 10 seconds
Playback Mode	Pause/Play/Previous Clip/Next Clip/Exit; Ability to mark favorites
Screen Saver	Plays videos with no audio

TABLE 3

Feature	Specification
Range	Non-line of sight (RF); Up to 50 ft
Battery Life	More than 1 year
Battery Indicator	Notification to receiver when batteries are low
Buttons	Up/Down/Left/Right; Select/Enter
Universal Compatibility	Programmable into universal remote controls
Find my Remote	Activated through software on computer; Beeps beeper in remote

TABLE 4

Feature	Specification
Interface	USB 2.0
Power	USB bus power
Co-existence	Can co-exist with Flip camcorder
Storage	256 MB capacity; Pre-loaded with software

[0046] FIG. **3** is a simplified schematic diagram of a receiver **110**, according to an embodiment of the present invention. The receiver **110** includes a power connector **310** configured to receive power from a power supply, such as a 110-volt electric supply. In one embodiment, a power port **111** on the side of the receiver **110**, as illustrated in FIG. **1**, is utilized as the power connector **310**. The receiver **110** also includes processor **330** and transceiver **350**, which is coupled to antenna **352**. The transceiver **350** is operable to provide two-way communications with a matched transceiver in the transmitter **120**. In some embodiments, the receiver **110** provides for two-way communications. However, since the dominant operation of the receiver is receiving video content transmitted by the transmitter **120**, the nomenclature of "receiver" is used herein to describe this component of the communications system.

[0047] The receiver **110** includes one or more audio outputs **370** and one or more video outputs **372**. The audio outputs **370** provide an audio signal to a display device, such as a television. The video outputs **372** provide a video signal to the display device. A wide variety of audio and video outputs are included within the scope of embodiments of the present invention. For example, the audio and video outputs can be combined in an HDMI output configured to connect to an HDMI cable. Since HDMI cables carry both audio and video signals, only a single cable is needed to couple the receiver **110** to the display device. In other applications, RCA component video outputs, optical-fiber based outputs, composite video outputs, S-Video outputs, or the like are utilized. One of ordinary skill in the art would recognize many variations, modifications, and alternatives.

[0048] Optional audio inputs **380** and video inputs **382** are illustrated in FIG. **3**. These optional inputs, which correspond to optional HDMI input **116** and optional RCA inputs **118** illustrated in FIG. **1**, are utilized, in some embodiments, when the receiver **110** is employed in a "pass-through" configuration. In a pass-through configuration, audio and video signals from a device, such as a set-top box, are provided to the audio in **380** and the video in **382**, respectively, of the receiver **110**, which then pass these signals to the audio out **370** and the video out **372**, respectively, in a first mode of operation. Alternatively, when video content from the transmitter **120** is received by the transceiver **350**, the signal passed to the audio and video out is changed to display the video content received through the wireless connection on the display device. In some embodiments, this is a second mode of operation. Thus, in configurations where the number of inputs to the display device is limited, only a single input or cable is needed to display content from either the other device or from the transmitter **120**. The mechanism for transitioning from one input signal to another may depend on the particular application and should not be understood to limit embodiments of the present invention. For example, the receiver may include non-volatile memory **320** used to store settings and the like. In a particular embodiment of the present invention, the receiver **110** may be integrated into the display device, thus further reducing complexity and the need of providing a cable between the receiver **110** and the display device.

[0049] FIG. **4** is a simplified schematic diagram of a transmitter **120**, according to an embodiment of the present invention. The transmitter **120** includes a USB connector **410** connected to processor **430**. Although the USB connector **410** is illustrated in FIG. **4**, the USB connector **410** is not required by embodiments of the present invention and other suitable com-

munications protocols and standards can be utilized by other embodiments of the present invention. The ubiquity of the USB standard and the availability of USB ports, either on the computer or on a USB extender connected to the computer, make the use of a USB connection a suitable connector for embodiments of the present invention. The transmitter **120** also includes transceiver **450** and antenna **452**, providing for two-way communications with the receiver **110** paired with the transmitter **120**. In some embodiments, the transceiver **450** and antenna **452** provide for two-way communications. However, since the dominant operation of the transmitter **120** is transmitting video content to the receiver **110**, the nomenclature of "transmitter" is used to describe this component of the communications system.

[0050] In some embodiments, when the transmitter **120** is coupled to computer **220** for the first time, the transmitter **120** may identify itself to the computer **220** as a mass storage device, such as a removable disk drive. In one embodiment, for instance, after the transmitter **120** is coupled to the computer **220**, the transmitter **120** may identify itself as a removable disk drive to an operating system executing on the computer **220**. The operating system can then treat the internal non-volatile memory **420** of the transmitter **120** like any other removable disk. This behavior is similar to the behavior discussed in relation to the camcorder described in U.S. patent application Ser. No. 11/497,039, filed on Jul. 31, 2006, the disclosure of which is hereby incorporated herein by reference in its entirety for all purposes.

[0051] In one embodiment, a resident software application is stored in the non-volatile memory **420** of the transmitter **120**. When a connection between the transmitter **120** and the computer **220** is detected by the computer **220**, an operating system executing on the computer may automatically execute the resident software application. For example, a Windows® operating system may be configured to check the contents of the non-volatile memory of the transmitter for an "autoplay.inf" file upon detecting a connection between the transmitter and the computer. The "autoplay.inf" file then directs the operating system to the resident software application, which is stored in the non-volatile memory **420** of the transmitter **120**. The operating system of the computer **220** then executes the resident software application.

[0052] In some embodiments, upon execution, the resident software application may check the computer **220** to determine whether required software components are available on the computer **220**, and then install the software components in the computer **220** when the software components are not available on the computer **220**. If appropriate software is already installed on the computer **220**, then the resident software application may check the installed software to determine if the software is a current version and then update the computer, if needed. For example, the resident software application may determine whether certain compression/decompression algorithms (codecs) are available on the computer **220**. If the resident software application determines that the codecs are not available on the computer **220**, the resident software application may then automatically install the codecs on the computer **220** without additional user intervention. In other embodiments, the resident software application may wait for verification from a user before installing the software components. The resident software application may also install other software components such as software libraries or application files. The resident software, in one embodiment, may also cause data to be written to memory in the computer **220** for tracking purposes. For instance, the resident software may add entries or keys to the registry of a computer **220** running the Windows® operating system so that upon a subsequent connection to the same computer **220**, the resident software application can simply check the registry entries or keys to determine which codecs or software components were previously installed. In still further embodiments, if the version of the resident software application stored in the non-volatile memory **420** is older than the version of the software application installed on the computer, then the resident software application stored in the non-volatile memory **420** may be over-written to update the software stored in the non-volatile memory **420** to the most recent version.

[0053] In one embodiment, the resident software application may produce a graphical user interface (GUI) on a display associated with the computer **220**. The GUI may present a user with graphical controls to help the user to perform various tasks. Such tasks may include playing digital video footage present on the computer **220**, and the like.

[0054] As described above, in some embodiments, during an initial connection, the transmitter **120** may identify itself to the computer **220** as a mass storage device and a resident software application present on the transmitter **120** may be used to install software on the computer **220**. After completion of these tasks, the transmitter **120** may modify its own operation to function as a transmitter **120** of video footage. This dual-purpose use of transmitter **120** differs from conventional systems in which pluggable devices serve only one of the two roles.

[0055] In one embodiment, the processor **430** and switch **460** are operable to convert the use of the transmitter **120** from a mass storage device, as described above, to a wireless transceiver. Logic stored in the non-volatile memory **420** may be utilized in making this switch from the first state of operation (e.g., mass storage device mode) to the second state of operation (e.g., wireless transceiver mode). In an embodiment, after installation of the software on the computer **220**, the transmitter **120** may "eject" itself, ceasing to function as a mass storage device, and may begin operation as a wireless transceiver in communication with receiver **110**.

[0056] It should be noted that, in some embodiments, the transmitter **120** includes not only the functionality of switching from a mass storage device to a wireless transceiver, but also the functionality of switching back to a mass storage device as appropriate. For example, if after use with a first computer, the transmitter is moved to another computer, then the transmitter may repeat the processes described above, acting as a mass storage device, determining if appropriate software is installed, installing and/or updating the software if needed, and/or then switching into the wireless transceiver mode.

[0057] FIG. **5** is a flow diagram of method steps for operating a communications system, according to an embodiment of the present invention. The method **500** includes establishing a connection between a receiver and a display device (**510**). The receiver includes a first wireless transceiver, a video output, and an audio output. An exemplary receiver is illustrated as receiver **110** in FIG. **1** in which the video and audio outputs can be combined as an HDMI connector or kept separate in the form of component RCA video/audio outputs. In some embodiments, as described in relation to FIG. **1**, the receiver provides for two-way communications. However, since the dominant operation of the receiver is receiving video

content from the transmitter **120**, the nomenclature of "receiver" is used to describe this component of the communications system. An example of a display device is a television. Establishing the connection between the receiver and the display device may take the form of connecting the two devices using one or more cables, for example, an HDMI cable.

[0058] The method **500** also includes establishing a connection between a transmitter and a computer (**512**). The transmitter includes a second wireless transceiver and a memory. An exemplary transmitter is transmitter **120** with USB connector **122** (i.e., a USB dongle) illustrated in FIG. **1**. The transmitter is operable to operate in a first mode and a second mode. In some embodiments, as discussed in relation to FIG. **1**, the transmitter provides for two-way communications. However, since the dominant operation of the transmitter is transmitting video content to the receiver **110**, the nomenclature of "transmitter" is used to describe this component of the communications system.

[0059] The transmitter initially operates in a first mode associated with a mass storage device. Thus, when the transmitter is connected to the computer, for example, by plugging the USB connector of the transmitter into a USB port on the computer, the transmitter appears or is registered as a mass storage device in the operating system. In some embodiments, software stored on the memory of the transmitter can be uploaded and installed on the computer while the transmitter is operating in the first mode (**514**). This feature of the transmitter enables for distribution of desired software for use in conjunction with embodiments of the invention.

[0060] The method **500** also includes an optional process of modifying a state of the transmitter (**516**) from a first state to a second state. In the second state, the second wireless transceiver is activated and the mass storage device characteristics of the transmitter are turned off. This can be considered as dismounting or ejecting the mass storage device from the computer. Although the transmitter is not physically disconnected from the computer, the transmitter ceases to appear as a mass storage device in the operating system of the computer. This "ejection" operation is similar to ejecting a mass storage device through operating system commands, at which point the mass storage device ceases to be listed as an available disk. In alternative embodiments, the transmitter continues to be displayed as a mass storage device.

[0061] The method further includes transmitting the video content from the transmitter to the receiver while operating in the second mode (**518**). The second mode of operation continues while the transmitter is connected to the computer. The video content can be displayed on the display device (**520**) as an optional process.

[0062] As illustrated in FIG. **1**, a remote control **130** is provided in some embodiments of the present invention. In these embodiments, the method **500** can include transmitting one or more control signals from the remote control to the receiver. In turn, the one or more control signals, some subset of the control signals, or additional control signals based on the one or more control signals, can be transmitted from the receiver to the transmitter. Thus, user control over software executing on the receiver or executing on the computer can be provided by use of the remote control. In alternative embodiments, the software application executing on the computer may be configured to allow the user to control the transmitter and/or receiver from the computer. For example, the user may cause a video to be displayed on the display device coupled to the receiver, which is in communication with the transmitter, by selecting the video from the software application executing on the computer.

[0063] It should be appreciated that the specific steps illustrated in FIG. **5** provide a particular method of transmitting video content according to an embodiment of the present invention. Other sequences of steps may also be performed according to alternative embodiments. For example, alternative embodiments of the present invention may perform the steps outlined above in a different order. Moreover, the individual steps illustrated in FIG. **5** may include multiple substeps that may be performed in various sequences as appropriate to the individual step. Furthermore, steps may be added or removed depending on the particular applications. One of ordinary skill in the art would recognize many variations, modifications, and alternatives.

Generating Network Parameters

[0064] As described herein, embodiments of the invention provide a communication system where a transmitter coupled to a computer can communicate with a receiver coupled to a display device to playback media items on the display device. As also described herein, embodiments of the invention provide for "pre-pairing" the receiver and the transmitter during the manufacturing process and/or before delivery to the end-user. One advantage of embodiments of the invention is that no user input is required to configure the network connection between the transmitter and the receiver. Additionally, embodiments of the invention provide the pre-pairing of the transmitter and the receiver in a manner that is both unique and re-createable.

[0065] FIG. **6** is a flow diagram of method steps for generating network parameters, according to an embodiment of the present invention. Persons skilled in the art will understand that, even though the method **600** is described in conjunction with the systems of FIGS. **1-4**, any system configured to perform the steps of the method **600** illustrated in FIG. **6**, in any order, is within the scope of the invention.

[0066] As shown, the method **600** begins at step **602**, where a processor receives a unique identifier associated with a receiver. In one embodiment, the unique identifier is a serial number for the receiver. In one embodiment, the processor performing the steps of the method **600** is included in a computer operated by a manufacturer of the transmitter and the receiver. In alternative embodiments, the processor may be included in a computer operated by another entity in the supply chain that configures the network parameters of the transmitter and the receiver. In various embodiments, the serial number may include letters, numbers, and/or other characters. According to embodiments of the invention, each receiver made by the manufacturer has a unique serial number.

[0067] At step **604**, the processor receives a first encryption value. The first encryption value, also known in cryptography as a "salt," is used as part of a cryptographic algorithm. In one embodiment, the first encryption value is a 128-bit value. At step **606**, the processor calculates a hash of the serial number and the first encryption value. In some embodiments, a hash value is calculated by performing a hashing function using the sum of the serial number and the first encryption value as input to the hashing function. For example, the a Secure Hashing Algorithm (SHA), such as the SHA**1** hash algorithm, may be used to compute the hash value. In other embodiments, the MD**5** (Message-Digest algorithm **5**) is used to

computer the hash value. Additionally, in some embodiments, the result of the hash algorithm is a 160-bit value (e.g., when using SHA**1**) or a 128-bit value (e.g., when using MD**5**).

[0068] At step **608**, the processor generates a SSID (Service Set identifier) based on the hash of the serial number and the first encryption value. As known, a SSID identifies an 802.11-based network. In one embodiment, the SSID has a maximum length of thirty-two (32) characters, and performing step **608** comprises mapping the 160-bit value to 32 characters or less. Mapping the 160-bit value to 32 characters or less may include calculating the logarithm of the 160-bit value with base N. In one embodiment, N comprises sixty-two (62), i.e., calculating "base-**62** of the 160-bit value." In this embodiment, each of the sixty-two (62) encoding values may correspond to one of twenty-six (26) lower-case alphabetic characters (i.e., "a" through "z"), twenty-six (26) upper-case alphabetic characters (i.e., "A" through "Z"), or ten (10) digits (i.e., 0 through 9). For example, calculating 160 bits base-**62** may result in a twenty-nine (29) character alpha-numeric result. This result may be used as the SSID in configuring the network connection for the receiver-transmitter pairing. At step **610**, the processor encrypts the SSID. Various encryption techniques may be used to encrypt the SSID. In some embodiments, the SSID remains unencrypted and step **610** is omitted.

[0069] At step **612**, the processor stores the SSID in the non-volatile memory of the transmitter. When the transmitter is plugged-in to a computer by an end-user, software executing on the computer and/or on the transmitter can configure the network connection between the transmitter and the receiver without requiring user input by reading the SSID from the non-volatile memory.

[0070] Additionally, the method **600** described in FIG. **6** may be used to generate a network password for the network connection. In some embodiments, a second encryption value that is different from the first encryption value may be used to generate the network password. In alternative embodiments, the first and second encryption values are the same. The hash function may calculate the hash of the sum of the serial number and the second encryption value. Calculating base-**62** of the hashed result provides a network password that may be associated with the SSID. Additionally, the network password may be optionally encrypted, and is stored in the non-volatile memory of the transmitter. In one embodiment, the network password is created in compliance with the WPA**2** (Wi-Fi Protected Access **2**) security protocol. In alternative embodiments, the network password is created in compliance with any other security protocol.

[0071] Advantageously, embodiments of the invention provide network parameters (i.e., the SSID and the network password) that are both unique and re-createable. Uniqueness is preserved by generating the SSID before delivery to the user, thereby eliminating the possibility of a first user manually creating an SSID that is the same as another SSID manually created by a second user within close proximity to the first user. Moreover, the network parameters are re-createable. For example, a user may accidentally damage or misplace either the transmitter or receiver. The user could then contact a customer service department for the communication system and provide the serial number of the receiver to the customer service department. Since the transmitter and receiver were pre-paired during manufacturing, the manufacturer (or another entity in the supply chain) has access to the first and/or second encryption values. Once the serial number is provided by the user, the manufacturer can re-generate the SSID and/or network password from the serial number and replace the receiver or the transmitter, without having to replace both. Additionally, the SSID and network password would remain the same as in the original communication system purchased by the user.

Configuring the Network Connection

[0072] As described above, the end-user may purchase the transmitter and receiver as a pair. When the transmitter is coupled to a computer, software components executing on the computer are operable to configure the network connection between the transmitter and the receiver based on the SSID and the network password stored in the non-volatile memory of the transmitter. In one embodiment, the network is an IP (Internet Protocol) network, where each client device (i.e., each transmitter) includes a unique IP address.

[0073] In one embodiment, the receiver executes a DHCP (Dynamic Host Configuration Protocol) server as part of an embedded system included in the receiver. For example, the receiver may include a memory and a processor, where the memory stores an operating system that is executed by the processor. The operating system may include a DHCP server that maintains a list of IP addresses and is configured to assign IP addresses to one or more client devices (i.e., transmitters) in communication with the receiver.

[0074] FIG. **7** is a flow diagram of method steps for establishing a network connection between a transmitter and a receiver, according to an embodiment of the present invention. Persons skilled in the art will understand that, even though the method **700** is described in conjunction with the systems of FIGS. **1-4**, any system configured to perform the steps of the method **700** illustrated in FIG. **7**, in any order, is within the scope of the invention.

[0075] As shown, the method **700** begins at step **702**, where a transmitter broadcasts a DHCP request. At step **704**, the receiver executing a DHCP server receives the DHCP request that is broadcast by the transmitter. At step **706**, the receiver generates and/or assigns an IP address to the transmitter from a list of available IP addresses. At step **708**, the receiver responds to the transmitter with the IP address.

[0076] At step **710**, the transmitter receives the IP address from the receiver. At step **712**, the transmitter stores the IP address in a memory included in the transmitter. In various embodiments, the receiver also stores the IP address assigned to the transmitter in a memory included in the receiver. In this manner, the receiver is able to communicate with the transmitter based on the IP address.

[0077] Additionally, in various embodiments, two or more receivers may be in communication with a single transmitter. In these embodiments, each of the two or more receivers would be executing a DHCP server and would independently assign an IP address to the transmitter. Moreover, in alternative embodiments, a single receiver may be in communication with two or more transmitters. Accordingly, the single receiver would assign a different IP address to each transmitter. In still further embodiments, a first receiver and a first transmitter may be in communication with one another, and a second receiver and a second transmitter may be in communication with one another, where the first transmitter and the second transmitter are both coupled to the same computer. Since each of the first and second receivers execute its own DHCP server, conflicts are avoided.

[0078] Advantageously, since the DHCP server is executed by the receiver, instead of by the transmitter or by the computer to which the transmitter is coupled, operating system neutrality is achieved. According to embodiments of the invention, the receiver is configured to assign IP addresses to the transmitter without any information about what type of operating system (e.g., Windows®, Mac®, UNIX, or other) is executing on the computer to which the transmitter is coupled. Providing operating system neutrality provides for simpler engineering implementation of the communication system and for compatibility with new operating systems that have not yet been created.

Accessing Content Over the Network Connection

[0079] As described above, embodiments of the invention provide a communication system that allows a user to playback media items on the display device via the receiver and transmitter. In some embodiments, the communication system also includes a remote control in communication with the receiver. In one embodiment, the remote control is paired with the receiver in the same manner as the transmitter is paired with the receiver. In alternative embodiments, the remote control is paired with the receiver in any technically feasible manner.

[0080] FIG. **8** is a flow diagram of method steps for transmitting data between a transmitter and a receiver, according to an embodiment of the present invention. Persons skilled in the art will understand that, even though the method **800** is described in conjunction with the systems of FIGS. **1-4**, any system configured to perform the steps of the method **800** illustrated in FIG. **8**, in any order, is within the scope of the invention.

[0081] As shown, the method **800** begins at step **802**, where a receiver receives a user request to play a media item. In one embodiment, as described above, the receiver may receive a signal transmitted from the remote control that indicates that a selected media item should be played on the display device coupled to the receiver. In alternative embodiments, the user request may originate at the computer coupled to the transmitter, and may be received by the receiver from the transmitter.

[0082] At step **804**, the receiver transmits a request to an IP address associated with the transmitter for the media item. In one embodiment, the IP address is assigned to the transmitter by the DHCP server executing on the receiver, as described in FIG. **7**. In one embodiment, the IP address is a link-local address that provides a point-to-point communication link between the receiver and the transmitter, without providing the ability for the receiver to access the WAN (wide area network), LAN (local area network), or Internet to which the computer coupled to the transmitter has access.

[0083] At step **806**, the transmitter communicates with a web server executing in software on the computer system coupled to the transmitter. In one embodiment, the communication protocol between the transmitter and the web server is a HTTP (Hypertext Transfer Protocol) protocol, where the transmitter transmits HTTP requests to the web server and the web server responds to the HTTP requests with data. At step **808**, the transmitter receives a media item to be played from the web server in response to the request from the transmitter to the web server. In one embodiment, the request is an HTTP request for a particular byte range of the media item, and the web server is configured to return the byte range of the media item in the request. In some embodiments, the media item, or the portion of the media item associated with the byte range request, is stored locally on the computer executing the web server. In these embodiments, the web server simply returns the data requested. In other embodiments, the media item, or the portion of the media item associated with the byte range request, is not stored locally on the computer executing the web server and is stored on remote computer system or server. In these embodiments, the web server executing on the computer is configured to retrieve the data being requested from the remote server and cache a local copy of the media item on the computer executing the web server. In some embodiments, the web server executing on the computer is configured to pre-fetch content that the web server anticipates will be requested based on heuristics. Additionally, in some embodiments, once remote content has been cached locally on the computer in response to a request, if the same data is requested in a subsequent request, then the web server is configured to recognize that the data is already cached locally and does not retrieve the remote content again.

[0084] At step **810**, the transmitter transmits the media item, or the portion of the media item associated with the byte range request, to the receiver for playback on the display device coupled to the receiver.

[0085] Advantageously, embodiments of the invention provide a secure "closed system," which is no less secure than the user's Internet connection. Even though the receiver and the transmitter communicate with one another wirelessly, the connection may be a point-to-point link-local connection where there is no routing entry to allow the receiver to access the WAN.

[0086] Various embodiments of the invention may be implemented as a program product for use with a computer system. The program(s) of the program product define functions of the embodiments (including the methods described herein) and can be contained on a variety of computer-readable storage media. Illustrative computer-readable storage media include, but are not limited to: (i) non-writable storage media (e.g., read-only memory devices within a computer such as CD-ROM disks readable by a CD-ROM drive, flash memory, ROM chips or any type of solid-state non-volatile semiconductor memory) on which information is permanently stored; and (ii) writable storage media (e.g., floppy disks within a diskette drive or hard-disk drive or any type of solid-state random-access semiconductor memory) on which alterable information is stored.

[0087] It is also understood that the examples and embodiments described herein are for illustrative purposes only and that various modifications or changes in light thereof will be suggested to persons skilled in the art and are to be included within the spirit and purview of this application and scope of the appended claims.

What is claimed is:

1. A method for generating network parameters for a communications system, the method comprising:

calculating a hash value based on a unique identifier associated with a receiver device and a first encryption value, wherein the communications system includes a transmitter device configured to perform two-way wireless communications with the receiver device;

generating one or more network parameters for use in establishing a network connection between the transmitter device and the receiver device within the communications system based on the hash value; and

storing the one or more network parameters in a non-volatile memory included in the transmitter device.

2. The method of claim **1**, wherein the one or more network parameters include at least one of an SSID (Service Set Identifier) and a network password.

3. The method of claim **2**, further comprising the step of generating the SSID by performing an encoding operation that includes at least the hash value as an input.

4. The method of claim **3**, wherein the encoding operation comprises calculating a base-N logarithm of the hash value.

5. The method of claim **4**, wherein N equals 62.

6. The method of claim **2**, further comprising the steps of:

calculating a second hash value based on the unique identifier and a second encryption value;

generating the SSID associated with the network connection based at least in part on the hash value; and

generating the network password associated with the network connection based at least in part on the second hash value.

7. The method of claim **6**, further comprising the step of encrypting the network password prior to the step of storing the one or more network parameters in the non-volatile memory included in the transmitter device.

8. The method of claim **1**, wherein the first encryption value comprises a 128-bit value.

9. The method of claim **1**, wherein the step of calculating the hash value comprises performing a Secure Hash Algorithm (SHA) hashing operation that includes the sum of the unique identifier and the first encryption value as an input to the SHA hashing operation.

10. The method of claim **1**, wherein the unique identifier comprises a serial number of the receiver device.

11. A computer-readable storage medium storing instructions that, when executed by a processor, cause a computer system to generate network parameters for a communications system, by performing the steps of:

calculating a hash value based on a unique identifier associated with a receiver device and a first encryption value, wherein within the communications system includes a transmitter device configured to perform two-way wireless communications with the receiver device;

generating one or more network parameters for use in establishing a network connection between the transmitter device and the receiver device within the communications system based on the hash value; and

storing the one or more network parameters in a non-volatile memory included in the transmitter device.

12. The computer-readable storage medium of claim **11**, wherein the one or more network parameters include at least one of an SSID (Service Set Identifier) and a network password.

13. The computer-readable storage medium of claim **12**, further comprising the step of generating the SSID by performing an encoding operation that includes at least the hash value as an input.

14. The computer-readable storage medium of claim **13**, wherein the encoding operation comprises calculating a base-N logarithm of the hash value.

15. The computer-readable storage medium of claim **14**, wherein N equals 62.

16. The computer-readable storage medium of claim **12**, further comprising the steps of:

calculating a second hash value based on the unique identifier and a second encryption value;

generating the SSID associated with the network connection based at least in part on the hash value; and

generating the network password associated with the network connection based at least in part on the second hash value.

17. The computer-readable storage medium of claim **16**, further comprising the step of encrypting the network password prior to the step of storing the one or more network parameters in the non-volatile memory included in the transmitter device.

18. The computer-readable storage medium of claim **11**, wherein the first encryption value comprises a 128-bit value.

19. The computer-readable storage medium of claim **11**, wherein the step of calculating the hash value comprises performing a Secure Hash Algorithm (SHA) hashing operation that includes the sum of the unique identifier and the first encryption value as an input to the SHA hashing operation.

20. A computer system for generating network parameters for a communications system, the computer system comprising:

a processor configured to:

calculate a hash value based on a unique identifier associated with a receiver device and a first encryption value, wherein the communications system that includes a transmitter device configured to perform two-way wireless communications with the receiver device,

generate one or more network parameters for use in establishing a network connection between the transmitter device and the receiver device within the communications system based on the hash value, and

store the one or more network parameters in a non-volatile memory included in the transmitter device.

21. The computer system of claim **20**, further comprising a memory storing instructions that, when executed by the processor, configure the processor to:

calculate the hash value;

generate the one or more network parameters; and

store the one or more network parameters in the non-volatile memory.

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